WORK PLAN

for the
Operation and Maintenance
of the
Rockaway Borough OU-4 Soil Vapor Extraction System
Rockaway Borough, New Jersey

Revision 1 February 28, 2011

Prepared for: U.S. Army Corps of Engineers Kansas City District Contract No: W912DQ-09-D-3003 Delivery Order No: DO-0004

Prepared by:

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WORK PLAN

Revision 0

Rockaway Borough OU-4 Soil Vapor Extraction System Rockaway Borough, New Jersey

William Colvin	Date
LATA Quality Control Manager	Date
Todd Struttmann, P.E. LATA Program Manager	Date
Shannon Lloyd LATA Sr. Project Manager	Date
Saqib Khan USACE Project Manager	Date

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List of Abbreviations and Acronyms

ASTM American Society for Testing & Materials

bgs below ground surface
cfm cubic feet per minute
COC contaminants of concern
DoD Department of Defense
DOT Department of Transportation
DQCR Daily Quality Control Report

FS Feasibility Study FSP Field Sampling Plan

FUDS Formerly-Used Defense Sites GAC granular activated carbon

gpm gallons per minute

HASP/APP Health and Safety/Accident Prevention Plan

Hg mercury

HOA Hand/Off/Auto
in. of H₂O inches of water
KCD Kansas City District
NYD New York District

LATA Los Alamos Technical Associates, Inc.

MCL maximum contaminant level

PCE perchloroethylene
PDT project delivery team
POC point of contact
QA quality assurance

QAPP Quality Assurance Project Plan

QC quality control QCP Quality Control Plan

RBWF Rockaway Borough Well Field Superfund Site

RI Remedial Investigation SAP Sampling and Analysis Plan

Site Rockaway OU-4

SSHP Site Safety and Health Plan

s.u. standard units
SVE soil vapor extraction
TCE trichloroethylene

TCLP toxicity characteristic leaching procedure

μg/L micrograms per liter μg/kg micrograms per kilogram

USACE United States Army Corps of Engineers
USEPA US Environmental Protection Agency

VOCs volatile organic compounds

WP Work Plan

WS/EM Wall Street/East Main



1.0 PROJECT BACKGROUND

1.1 Site Location and History

1.1.1 Site Location

The Site is located at 2 Wall Street in Rockaway Borough, New Jersey. The property has been identified as Block 45, Lot 20.

Rockaway Borough (the Borough) is located in central Morris County, New Jersey. The Borough is approximately 2.1 square miles in size and is located 10 miles north of Morristown and 25 miles northwest of Newark in the north-central portion of the state. Rockaway Borough is bordered to the north and west by Rockaway Township and to the east and south by Denville (see Figure 1-1). Land use in the Borough is a mix of commercial, industrial, and residential.

1.1.2 Site History and Description

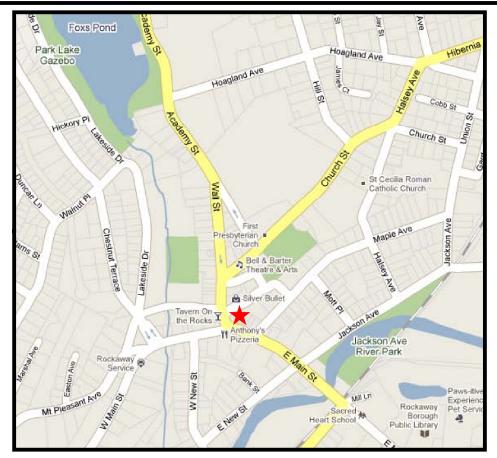
The Wall Street/East Main (WS/EM) Area is a portion of the larger Rockaway Borough Well Field (RBWF) Superfund Site. The RBWF Superfund Site includes three municipal water supply wells (Nos. 1,5 and 6) which are located off Union Street in the eastern section of Rockaway Borough. The groundwater at the municipal water supply wells is contaminated primarily with perchloroethylene (PCE) and trichloroethylene (TCE). Based on prior investigations, the suspected sources of the PCE and TCE contamination include industrial operations within Rockaway Borough, including a former dry cleaning operation at 2 Wall Street. Dry cleaning operations at 2 Wall Street began in approximately 1950 and ended in 2007.

The WS/EM Area is primarily a commercial area in the heart of downtown Rockaway Borough. The businesses located in this area include dry cleaning, auto body repair, auto service and repair, banking, hardware, hair dressing, convenience stores and food establishments. In addition Rockaway Borough Police and Fire Departments, Memorial Park and municipal parking lots are located within close proximity to the Site.

The developed portions of the WS/EM Area are covered by impervious surfaces including asphalt roadways and driveways, concrete building slabs and sidewalks, and asphalt parking areas. A limited number of small, fragmented areas of exposed soils comprising suburban parkland, mowed lawns, ballfields and playgrounds, and fragmented areas of forested habitats, occur in the developed portion of the WS/EM Area.

The 2 Wall street Building was constructed in approximately the mid 1800's and subsequent additions in the late 1800's and between 1960's - 1970's. A front portion of the Building facing Wall Street is underlain by an earthen floor and stone wall foundation with the rear of the Building is a concrete slab on grade.

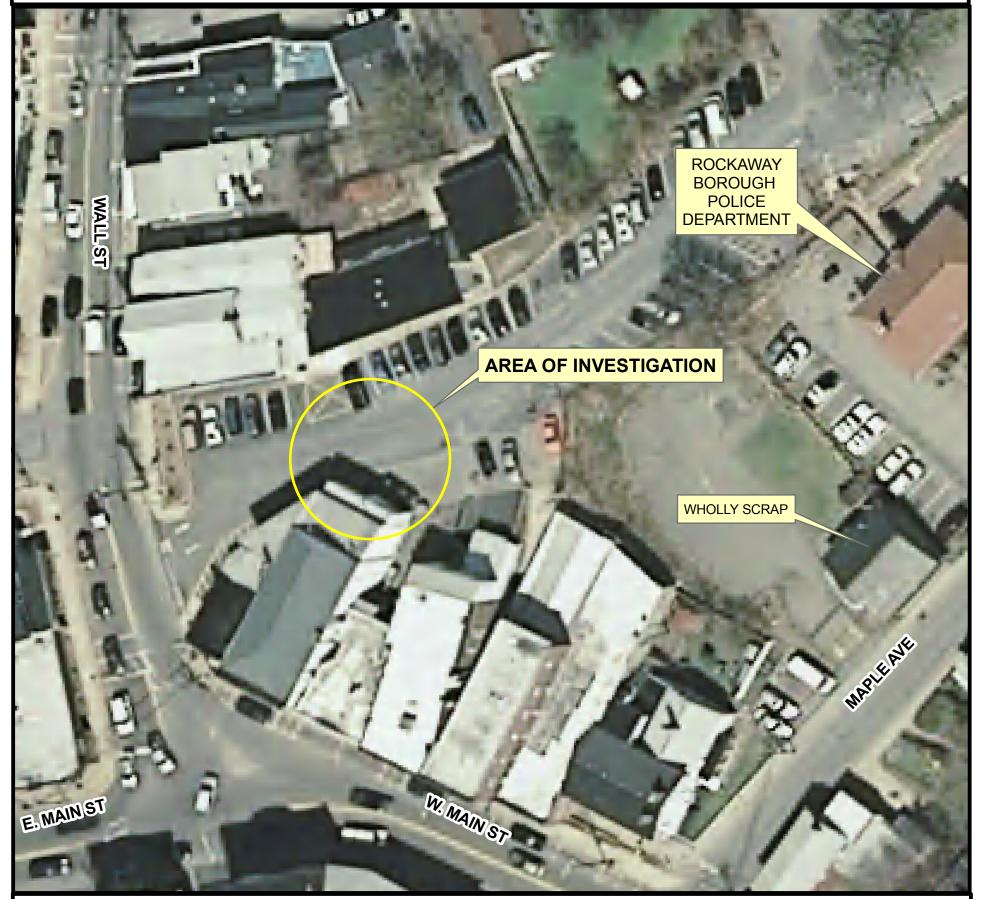




ROCKAWAY BOROUGH TOWNSHIP SITE LOCATION MAP



MORRIS COUNTY, NJ SITE VICINITY





1 inch equals 40 feet 0

75 Feet

FIGURE 1-1 SITE MAP



2.0 PROJECT ORGANIZATION AND MANAGEMENT

2.1 Project Organization

The project organization chart for the Site is shown on Figure 2-1. Roles and responsibilities are described below. Project and Program Management personnel have experience in managing environmental projects, including FUDS and Superfund Sites, as well as technical expertise in groundwater remediation. Biographical information for key team members are provided as Appendix QCP-1 in the QCP.

USACE-KCD

Mr. Saqib Khan is the USACE-KCD Project Manager for the Site. The USACE-KCD Project Manager is responsible for budget, schedule, technical direction, and consultant management. The USACE-KCD Project Manager is also the primary point of contact (POC) with the regulatory agencies for this project. USACE-KCD Project Manager is responsible for providing adequate consultant management and oversight to assure that the consultants are completing their tasks in accordance with the requirements of this Technical Work Plan.

Mr. Saqib Khan is supported by the following individuals:

- Mr. Kevin O'Brien USACE
- Mr. Frank Bales USACE
- David Evans USACE

Consultants

LATA is the lead consultant for activities conducted at the Rockaway Borough. LATA does not currently anticipate the need to utilize any subcontractors for this project, outside of analytical laboratory services. As such, all onsite work will be performed by employees of LATA's Edison, NJ office and Westerville, OH offices. The split of work within the LATA team takes advantage of the expertise of each team member as well as the location of staff proximate to the Site, while keeping project management oversight and accountability within LATA's Westerville, Ohio, office.

Senior Project Manager

Mr. Shannon Lloyd is the senior project manager for the Long Term Response Action (LTRA) contract and will be the primary Point of Contact (POC) for all contractual issues. Mr. Lloyd is responsible for assuring that the project is properly staffed and is responsible for overall technical direction and quality of the work performed. The Senior Project Manager establishes budgets and schedules, assures that personnel have appropriate training, and monitors staff performance. In addition, the Senior Project Manager is responsible for monitoring and implementation of the Quality Assurance/Quality Control (QA/QC) program. Specific responsibilities include:



Assure that labor, equipment, personnel and funding are available for required tasks; and Project technical direction.

Project Manager

Mr. Lloyd has selected Mr. Bill Colvin, as Project Manager (PM) for this task order. Mr. Colvin will be the primary POC for execution of this work. Mr. Colvin will be responsible for overall administration of the project, coordination of field efforts, attendance at project progress meetings and regular reporting activities. He will manage the day-to-day activities and will be responsible for maintaining schedule. The PM will interface with the Project Delivery Team (PDT) to verify that the goals of the project are being met and will conduct the senior technical review of deliverables.

- Coordinate preparation, review, and approval of reports, plans and procedures;
- Provide QA support in matters involving quality of work;
- Assure response to corrective action requirements identified by the project team;
- Maintain and track project budget and schedule; and
- Coordinate personnel and field activities.

Health and Safety Manager

The Rockaway Borough project Health and Safety Manager is Mr. Joe Shuman. Mr. Shuman will provide guidance to project personnel who are responsible for implementation of the corporate LATA Health and Safety Program Plan. Mr. Shuman is responsible for investigating health and safety incidents/occurrences, working with the Project Manager to identify corrective actions, and making recommendations on policy changes needed to prevent or minimize future occurrences. The Health and Safety Manager is the only LATA employee or contractor with the authority to determine the suitability of an employee to perform job duties on the basis of health or fulfillment of health and safety training as required by law or regulation. The Health and Safety Manager is also responsible for directing annual or periodic reviews of LATA health and safety plans, as appropriate.

Specific responsibilities of the Health and Safety Manager include:

- Reviewing and approving the Site Safety & Health Plan (SSHP);
- Evaluating the qualifications of the Site Safety & Health Officer;
- Reviewing proposed corrective action and assessing them once implemented to evaluate effectiveness;
- Approving significant changes in personal protective equipment (PPE) or protective procedures;
- Conducting accident investigations and preparing reports; and
- Approving changes to the SSHP, engineering controls, work practices and PPE.



Site Supervisor

Given the limited scope of this project, LATA anticipates that the Site Supervisor will fill several roles for the various activities associated with the work. Mr. Christopher DeCarlo will serve as the Site Supervisor. Mr. DeCarlo will be responsible for overseeing field personnel (if any are needed) performing various tasks to ensure that the acceptability and performance criteria of this project are met. Mr. DeCarlo will serve as the onsite Safety representative, ensuring that all work is conducted in a safe manner, and following applicable site specific safety plans, as well as LATA corporate safety documents. Mr. DeCarlo will also be the acting onsite QA Manager. In this role, he will be responsible for maintenance of the LATA quality management system, as well as relevant portions of this QCP and the QAPP as they relate to site activities.

Project Delivery Team

The PM for this project will have a number of technical resources (the PDT) available for use on this project. The PDT is responsible for developing project documents and performing project field activities as needed. The PDT will perform ongoing interdisciplinary quality control checks during product development to insure that portions of the products developed by different team members do not conflict.

Brian Kiess will serve as the Project Engineer. The Project Engineer is responsible for preparing field-related portions of the work plans and reports and, as needed, implementing field activities. If changes to the design of the system are needed in the future, the project engineer will be utilized in all new designs, calculations, and installations of said changes.

The Project Geologist is Raelyn Welch, who is responsible for preparing field-related portions of the work plan and report and implementing field activities as needed. Ms. Welch will also be utilized if the needs for new wells arise.

The Project Chemist and Chemical Quality Control Coordinator is James Moore, who is responsible for developing the project QAPP, document coordination, coordinating with the analytical laboratory, data management, data evaluation and validation, and preparation of the chemistry- and data-related portions of the work plans and data report(s).

Bill Colvin will also act as the Project QC Inspector. Mr. Colvin will oversee the field personnel performing the various tasks to ensure that the acceptability and performance criteria are met as well as oversee operations of the SVE system. In this role, Mr. Colvin will utilize any applicable checklist included with the QCP during any onsite inspections.



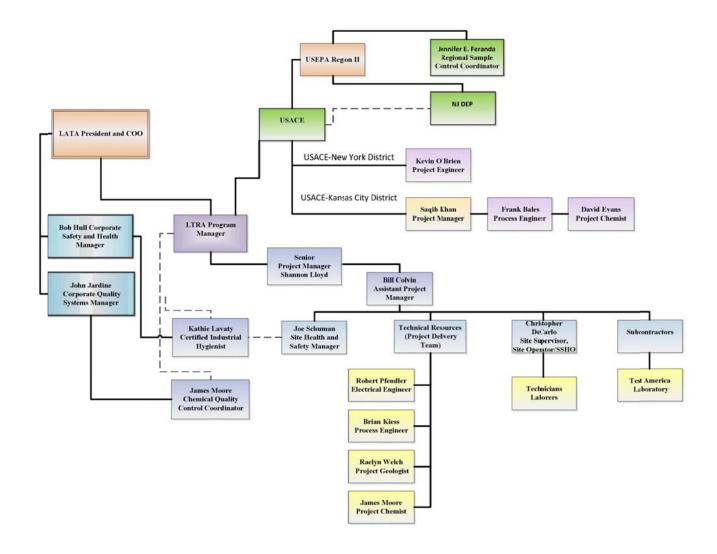


Figure 2-1 Project Organization



2.2 Project Management

2.2.1 Reporting

Documents, in electronic and hard copy form, are the principal means whereby work instructions, process and performance criteria are established and communicated within LATA and are often the product of LATA's work (e.g., a deliverable under the contract). It is, therefore, essential that documents are produced within a framework that promotes quality. Section 9.0 of the QCP documents the process used by LATA to ensure that the scope and contents of documents address the appropriate standards, do not conflict with each other, clearly convey accurate information and/or instructions, and the most current approved documents are made available for use by the workforce.

Daily Quality Control Reports (DQCR) will be prepared by the field staff and submitted to the PM daily when onsite for monitoring, maintenance or sampling activities. The DQCR will be included in the monthly progress report. A copy of the DQCR report is presented in Appendix B.

LATA will prepare progress reports for submittal to the USACE on a monthly basis. The monthly report will detail issues such as activities completed for the month, operational issues, analytical results for samples collected the previous month and plans for the coming month.

3.0 SVE OPERATIONS

3.1 Site Visits

Site visits will be made weekly for the first month of operation. Site visits thereafter will be on a monthly basis at minimum. Additional site visits may be made to address operational alarms and other site maintenance activities.

3.2 Air Permit

A copy of the air permit application is presented in Appendix C. Once the air permit is attained a copy of the actual permit will be placed in this document.

3.3 Residuals and Waste Management

Waste generated during the performance of this work will be properly containerized, placed in a waste storage area (treatment system, shed) and, as required, tested prior to disposal. Solid waste generated outside the work zone (i.e. paper, trash, packaging, etc.) will be placed in the appropriate waste receptacle for off-Site disposal. The following criteria will be used to determine disposition of the wastes generated.



3.3.1 Spent Carbon

The spent carbon may be sent offsite for regeneration or disposal. This is dependent on the capabilities of the facility selected. LATA will coordinate testing, regeneration or transportation and disposal with a facility permitted and licensed to handle this waste stream.

3.3.2 Water

Any water generated as result of operations (accumulated water in the knockout, bailed/removed from the extraction wells, etc.) will be containerized and transported to the Rockaway OU-2 groundwater treatment system for disposal through the system.

4.0 SOIL VAPOR EXTRACTION

PCE impacted soils in the source area will be addressed with SVE. Details of the SVE system and its components are presented in the sections below. The system will be operated to maintain discharge permit limits established for the site.

4.1 SVE Components

The SVE treatment system comprises of two vertical and one horizontal extraction well, a regenerative blower, condensate knockout vessel, two 85 gallon vapor phase GAC canisters and associated piping, gauges and airflow meters.

The SVE system is housed within a wood framed structure located adjacent to the rear of the building at 2 Wall Street. The shed houses the blower, filters, 30 gallon moisture separator, GAC drums and the system control panel. The system operates on 240/120-volt, single phase, 100-amp service.

Each extraction well is individually controlled by the use of a manual ball valve within the SVE shed at the well head. A dilution air filter is installed before the inlet filter to allow clean air to be introduced into the piping. Appendix A contains the Summary of Operations (as-builts and operations manuals) for the treatment system.

4.2 SVE System Equipment

The SVE system blower is a regenerative blower designed to induce a total vacuum of up to 63 inches of water (in. of H_2O) at 141 cubic feet per minute (CFM). This system will draw vapors from the wells into a 30-gallon moisture separator for removal of any water that is drawn into the exterior piping. The moisture separator has a manual valve for extraction of any collected moisture from the system. Vapors then pass through an inlet filter to remove any particulate from the inlet air stream. Vapors continue through two 85 gallon, vapor phase, GAC vessels. Vapors exit the facility through a four inch stack to the atmosphere.



4.3 SVE System Controls and Instrumentation

The individual air flow meters, temperature gauges and sample ports are installed in the piping to monitor performance of the SVE system. LATA will collect readings for the system at each of these locations.

The control panel is equipped with pilot lights, a Hand/Off/Auto switch, timer and reset button. The blower is wired with a HOA switch for operation of the system in either automatic or hand position.

A run time meter is installed on the system to monitor total run time for the system.

The timer installed in the enclosure door provides the operator the ability to change the run sequence of the blower.

A phone line is supplied for the autodialer to notify the operator of alarm conditions. Alarm conditions include: moisture separator high level, Blower high discharge pressure, blower motor overload tripped and power fail.

Additional product information on the SVE system and process controls is included in Appendix A

4.4 SVE Performance Monitoring

4.4.1 Operational Data

LATA will collect field data readings (flow rate, PID readings, vacuum and pressures, etc.) to monitor the operation and progress of the treatment system. Operational data will be collected during each visit to the site. This data will be recorded on a field sheet as shown in Appendix B and maintained at LATA's offices. A copy of the reading sheet will be included in the monthly status report.

Field monitoring equipment will be calibrated per the manufacturer's recommendations and documented in the field book and on field reading sheets.

4.4.2 Air Discharge Monitoring

LATA will monitor the effectiveness of the SVE system by collecting vapor samples for VOC analysis for the following monitoring events:

During the initial startup period LATA will monitor the operation of the system on a weekly basis. This duration of this monitoring period is four weeks following startup of the system.

Weekly monitoring will include:



- Vacuum and photoionization detector (PID) readings will be collected weekly from each wellhead to assist in determining operations strategies.
- Influent, midpoint and effluent PID readings will be collected at the vapor phase carbon vessels.
- Flow rates and PID readings will be recorded and estimated discharge calculations will be made to verify that the present valve configurations are permitting the system to operate within permit limits. Valves will be adjusted to maintain permit limits.
- One air sample collected before and after the carbon system and will be analyzed by EPA method TO-15 to establish a baseline sample for the SVE system and verify compliance with the sites air discharge permit.
- Knock out drum will be checked for condensate water.
- Run time will be monitored and recorded on a weekly basis.

Following weekly monitoring LATA will monitor the system monthly at a minimum. Activities during the monthly monitoring include:

- Vacuum PID readings will be collected monthly from each wellhead to assist in determining operations strategies.
- Influent, midpoint and effluent PID readings will be collected at the vapor phase carbon vessels.
- Flow rates and PID readings will be recorded and estimated discharge calculations will be made to verify that the present valve configurations are permitting the system to operate within permit limits. Valves will be adjusted to maintain permit limits.
- One air sample collected before and after the carbon system and will be analyzed by EPA method TO-15 to establish a baseline sample for the SVE system and verify compliance with the sites air discharge permit.
- Knock out drum will be checked for condensate water.
- Run time will be monitored and recorded on a monthly basis.

Samples will be collected in accordance with the SAP. LATA will submit a hard copy and an electronic version of the process monitoring results of analytical data following each treatment event. The electronic data will be submitted in a spreadsheet (e.g., Microsoft Excel). LATA will also prepare a monthly report that summarizes the process monitoring results and assesses the data relative to the performance criteria.

5.0 REFERENCES

Los Alamos Technical Associates, 2010. Proposal for the operation & maintenance of the existing soil vapor extraction system and optimization at the Rockaway Borough Main/Wall Street Superfund Site.

Los Alamos Technical Associates, 2010. Quality Assurance Project Plan, LATA December 21, 2010

Los Alamos Technical Associates, 2010. Quality Control Plan, LATA, December 201, 2010

Ground/Water Treatment & Technology, Inc., 2010, Summary of Work Operations



Appendix A

Summary of Work Operations Groundwater Treatment & Technology

February 2010





GROUND/WATER TREATMENT & TECHNOLOGY, INC.

P.O. BOX 1174 DENVILLE, NEW JERSEY 07834 Phone (973)-983-0901 • Fax (973) 983-0903

SUMMARY OF WORK OPERATIONS

ROCKAWAY BOROUGH WELLFIELD SITE

BOROUGH OF ROCKAWAY MORRIS COUNTY, NEW YORK

FEBRUARY 2010

Prepared for:

AECOM 4840 Cox Road Glen Allen, VA 23060

Prepared by:

Ground/Water Treatment & Technology, Inc. PO Box 1174 Denville, New Jersey 07834

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1.0 PROJECT DESCRIPTION

This Summary of Work Operations has been developed by Ground/Water Treatment & Technology, Inc. (GWTT) to summarize the work that has been completed for the new Soil Vapor Extraction (SVE) system enclosure for the Rockaway Borough Well Field Site located at 2 Wall Street, Rockaway Borough, NJ. This work has been conducted in accordance with applicable portions of the U.S. Army Corps of Engineers (ACOE) 100% Design Analysis Report (the Design).

The Rockaway Borough Well Field project focuses on the removal of the PCE-contaminated soil that is found throughout the site due to dry cleaning operations that once occurred at this location. Dry cleaning operations at 2 Wall Street began around 1950 and occurred until 2008, at which time all of the dry cleaning chemicals and equipment were removed from the site.

The PCE-contaminated soil at Rockaway Borough Well Field has infiltrated into the groundwater. This remedial action was designed to remove potential source materials in order to minimize further spread of the contamination.

HDR Engineering, Inc. (HDR) was contracted by the U.S. Army Corps of Engineers, Kansas City to provide remedial design services as part of Operable Unit (OU) 4 at the Rockaway Well Field Site. The U.S. Environmental Protection Agency (EPA) through its remediation contractor, AECOM Technical Services, selected GWTT as a subcontractor of AECOM to install the Soil Vapor Extraction System.

2.0 PERMITTING

Ground/Water Treatment & Technology, Inc. (GWTT), on behalf of the United States Environmental Protection Agency (USEPA), submitted a permit equivalency application on November 4, 2009 for the installation of the new Soil Vapor Extraction (SVE) shed and the required electrical service. Copies of the construction permits are included in Appendix A.

3.0 WORK COMPLETED

3.1 <u>Excavation - Interior</u>

In order to complete the installation of the SVE Treatment System beneath the building, the existing concrete within the building at 2 Wall Street had to be cut and removed. On October 30, 2009, GWTT began the excavation work within the building by saw cutting the inside floor and removing the sections. On average, the concrete measured 6-inches in thickness.

Given the age of the building and lack of foundation as-built drawings, structural considerations had to be taken into account. During the excavation work within the building, engineers from HDR were on-site to monitor and evaluate potential structural impacts. Concrete cutting and excavation work followed the recommendations outlined in the Design.

Ground/Water Treatment & Technology, Inc. Rockaway Borough Well Field – OU No. 4

Summary of Work Operations February 2010

Once the vertical and horizontal limits within the building were obtained, AECOM and USEPA inspected the excavation and took the necessary post excavation samples. The final dimensions of the excavation, at the former floor level, measured 9.5-feet wide by 12-feet long, having a maximum depth of 4-feet below grade. Following sampling, the area was backfilled so that the structural integrity of the building would not be compromised and the owner could have access to the building. It should be noted that the Design called for the use of backfill materials which were then to be compacted using a vibratory plate compactor. However, in light of the building age and construction practices used, HDR agreed that the using a vibratory compactor may impact building integrity. As a result, the entire excavation was backfilled with ¾-inch clean bluestone gravel provided by Tilcon Mt. Hope Quarry of Wharton, NJ. In addition, use of this material would facilitate air flow and possibly result in a faster soil vapor remediation beneath the building. In accordance with the Design, AECOM secured the archeological services of Hartgen Archeological Associates, Inc (HAA) of Rensselaer, NY. The purpose of the archeological monitoring was to preserve prehistoric and historic artifacts, if any.

GWTT followed the steps regarding backfill and compaction that were established in the 'Excavation Plan' submitted in October 2009.

3.2 Excavation – Exterior

In order to complete the installation of the SVE Treatment System outside of the building, the existing bituminous asphalt adjacent to the garage door had to be cut and removed. On November 2, 2009, GWTT began the excavation work outside of the building. During this excavation work both engineering and archeological representatives were on-site. Asphalt cutting and excavation work followed the recommendations outlined in the Design. During the excavation activities, an 8-inch diameter clay sanitary waste line was unearthed. In order to attain the excavation target depth, a section of this pipe was removed and later replaced with PVC piping. The PVC was mated to the vitrified clay using transition fernco couplings, which is allowable by plumbing code.

Once the vertical and horizontal limits were obtained, AECOM and USEPA inspected the excavation and took the necessary post excavation samples. The final dimensions of the excavation, at the ground level, measured 7-feet wide by 17-feet long, having a maximum depth of 5.25-feet below grade. Following sampling, the area was backfilled so that the structural integrity of the building would not be compromised and the owner could have access to the building. Backfilling was completed in accordance with the Design. In accordance with the Design, AECOM secured the archeological services of Hartgen Archeological Associates, Inc (HAA) of Rensselaer, NY. The purpose of the archeological monitoring was to preserve prehistoric and historic artifacts, if any.

GWTT followed the steps regarding backfill and compaction that were established in the 'Excavation Plan' submitted in October 2009.

3.3 Removal of Concrete, Asphalt and Contaminated Soil

3.3.1 Concrete and Asphalt Disposal

Concrete and asphalt generated during the excavation of impacted materials and installation of the SVE piping was placed into dedicated dumpsters located on-site. The dumpsters were provided by Blue Diamond Disposal and Recycling Service, a NJDEP licensed debris hauler.

The concrete and asphalt were sent to: Tilcon, 625 Mt Hope Rd, Wharton, NJ 07885; USEPA license No. 1-4722-04474/0001.

The concrete was sampled in accordance with the recently updated New Jersey Department of Environmental Protection (NJDEP) requirements for concrete recycling, and before the material was taken off site, the results were provided to AECOM. GWTT performed the sampling and sent the samples to Accutest Laboratories, Inc. in Dayton, NJ for the analyses. Accutest in a NJDEP-certified analytical laboratory (Certification No. 12129). Approximately 10-tons of non-hazardous concrete/boulder were transported to Tilcon Mt. Hope. The disposal tickets from Blue Diamond Disposal are attached in Appendix B. The concrete manifest from Blue Diamond will be presented to AECOM once it is received. The handling of the concrete was performed as stated in the 'Waste Management Plan' (Submittal No.12).

3.3.2 Contaminated Soil

All hazardous F002 soils genrerated during the interior and exterior excavations were staged in roll-off dumpsters provided by Waste Management of Model City, NY. The facility information is as follows:

• CWM Chemical Services, LLC, 1550 Balmer Rd, Model City, NY 14107; DEC Facility Permit No. 9-2934-00022/00097; EPA ID No. NYD049836679

Prior to transportation and disposal, the hazardous soils in the dumpster were sampled by GWTT, and analyzed by Accutest Laboratories. The analytical results for the soil waste classification sample and a letter of acceptance from Waste Management, as well as the manifests for soil transportation and disposal, were provided to AECOM prior to scheduling the shipment. Once AECOM provided their approval, the final manifests were signed by a representative from the USEPA as the generator. Copies of the manifests are presented in Appendix B.

The trucks hauling the dumpsters for Waste Management were provided by Freehold Cartage. An estimated quantity of 24.5 tons of hazardous waste solid F002 was hauled to Model City for treatment. The handling of the soils was performed as stated in the 'Waste Management Plan' (Submittal No.12).

3.4 <u>Treatment System Installation</u>

3.4.1 Piping and Wells

GWTT's drilling subcontractor, Hawk Drilling, installed the two new soil vapor extraction (SVE) wells in the Upper Parking Lot area. Hawk initially attempted to drill the wells using hollow stem augers methods. However, due to the presence of significant (greater than 12-inch diameter) boulders, refusal was encountered at shallow depths and the driller switched to air rotary methods. Each well was drilled to approximately 34-ft below ground surface (bgs). After the wells are drilled, GWTT excavated the outer area within the Upper Parking Lot, installed the horizontal SVE piping and terminate at each well. The area was then backfilled as required.

Inside the building, after GWTT reached the vertical limit and USEPA obtained the post excavation samples, GWTT placed approximately 3-inches of ¾-inch clean stone. GWTT then installed the 2-inches Sch 80 PVC pipe laterals, with intermittent 2-inches Sch 40 0.020 slot screen, as shown on Drawing No. C-102 of the design package. Once the pipe was in place and the penetration through the wall was completed using a 4-inch core barrel, GWTT backfilled the entire excavation to an elevation just below the existing concrete base using ¾-inch clean stone. This was a change from the design plans and specifications, but was discussed between USEPA, AECOM, HDR and GWTT as the best approach to backfilling with minimal disturbance to the surrounding structure(s). A layer of 12-ounce geofabric was placed over the clean stone.

Outside the building, within the Upper Parking Lot area excavation, GWTT installed 2-inch Schedule 80 PVC from both wells SVE-1 and SVE-2 to the location of the new enclosure. The piping was installed approximately 4-feet below grade, with a 1-feet pipe box (6-inches in all directions around the pipe) of bedding sand. Imported certified clean sand material was placed in 12-inch loose lifts in the exterior excavation and was compacted. GWTT had an independent testing vendor, Key-Tech, on site to complete the necessary compaction tests and insure the results meet the 95% Proctor requirement stated in the specification. Please see Appendix C for the technician's field report on compaction testing.

The pipes from SVE-1, SVE-2, and the line from within the building were extended horizontally to the point shown on C-102, and approximately 4-inches above grade. The pipes remained there until the new enclosure was received.

3.4.2 Shed

GWTT installed a prefabricated shed adjacent to the existing 2 Wall Street structure. The shed has dimensions of 8-ft wide, 9-feet 4-inches long by 8-feet high. Due to the presence of a cistern, the shed could not be placed on concrete piers or a concrete footing. The shed was placed on pressure-treated 6-inch by 6-inch lumber, with 6-inches of ¾-inch clean stone, as a 'house-keeping' base/pad. The shed was anchored in three locations using anchor screws, cable and turnbuckles. A new 220/110-volt, single phase, 100-amp electrical service was provided to the shed. The electrical service was inspected and approved by the Rockaway Borough building inspector.

Ground/Water Treatment & Technology, Inc. Rockaway Borough Well Field – OU No. 4

Summary of Work Operations February 2010

The shed is used as an SVE equipment enclosure. Located in the shed are be two (2) 180-pound granular activated carbon units, regenerative blower, moisture separator, ventilation equipment, thermostat, roof exhauster, and system control panel.

3.4.3 Concrete

Concrete restoration was needed for the interior floor and the exterior pad. Inside of the shed, a 6-inch concrete slab was placed above a 6-millimeter polyethylene vapor barrier. The slab was reinforced with #5 rebar at 12-inch on center attached to dowels drilled and set embedded 6-inches into the existing slab with adhesive. The edges of the slab were coated with a bonding agent.

The manholes of the SVE wells were cast in place by concrete 24-inches by 24-inches and 12 ³/₄-inches deep. The concrete in these areas were reinforced by #5 bar, 6-inches apart.

3.4.4 Electric

Electrical components are housed both on the interior and exterior of the new shed. The meter pan and fused disconnect were mounted to the exterior of the shed, with the overhead service to the required height for connection by JCP&L. The control panel was installed on the inside of the shed with other process equipment. A phone line/service was extended to the shed by Verizon, from the local utility pole. The phone line was activated and tested by GWTT.

Red-line as-built drawings of the system are located in Appendix D of this report.

3.5 <u>Cistern Abandonment</u>

During site operations, a cistern, 9-feet in diameter and 8-feet deep, was discovered underground on site. The existence of this cistern was unknown when the scope of work was established. It was decided that abandonment of the structure was necessary, since it was not advisable to remove the cistern. The existing structural supports for the adjacent buildings and existing walls on some of the buildings are not in good shape and would require significant bracing and support before any excavation could occur. The depth of the cistern is approximately 8-ft below existing grade, and at a 1:1 slope, the excavation would impact the adjacent buildings.

Limited information on the building footings was known, which limited the ability to estimate what type of bracing (helical piles, minipiles with lagging, tie-backs, etc.) could be safely and efficiently installed in a cost effective manner. Additionally, during excavation work GWTT encountered boulders from 6-in diameter up to approximately 36-in diameter. These boulders are native to the soils/geology in this area and it was reasonable to assume similar boulders would be encountered during the excavation. Removal of these boulders could adversely impact the supports of the nearby structures. Abandonment was also necessary to prevent the costly temporary relocation of overhead utilities.

Ground/Water Treatment & Technology, Inc. Rockaway Borough Well Field – OU No. 4

Summary of Work Operations February 2010

Nineteen cubic yards of flowable fill material provided by County Concrete were used to abandon the cistern. A sketch of the location of the cistern is provided in Appendix E.

3.6 <u>Site Restoration</u>

After the excavations were backfilled and compacted to the original grade, arrangements were made for loading, transporting, and final disposal of the unusable impacted materials. The material was sent to the recycling facility identified in Section 2.2 of this report and the 'Material Handling Plan.' In restoring disturbed concrete and asphalt at the site, GWTT insured that the restored areas do not direct surface water towards the existing and new wells, and did not allow drainage into the structures.

Final paving elevations are flush with the top elevation of the well road boxes and vaults. After the soils and asphalt were removed, and the staging area cleaned and swept, final restoration of the asphalt began. Final paving restoration included a 4.5-inch coarse graded binder course and 1.5-inch top course. Final paving was completed by GWTT subcontractor Fiore Paving.

4.0 START-UP OF TREATMENT SYSTEM

Start-up and commissioning of the SVE system was completed after the construction of the system was complete. A Commissioning Plan was previously provided by GWTT so that it was ensured that the fabricated system was built in accordance with the project drawings and specifications and that the system was completed to the satisfaction of AECOM and the USEPA. GWTT followed the Commissioning Plan during start-up of the system, and reviewed each step with AECOM during the process. Additionally, GWTT completed the pre-commissioning checklists that were provided by HDR.

The system was started-up by Pat Hunnewell on December 10, 2009. Additional information about the Commissioning Plan can be found in Appendix F.

5.0 OPEN ITEMS

There are a few items that GWTT is still in the process of completing:

• Operation and maintenance of the system needs to be performed regularly, and the operator has yet to be determined. See Appendix G for the Operation and Maintenance manual.

6.0 PHOTO DOCUMENTATION

Photographs were taken on-site prior to, during, and after completion on the construction of the new SVE system enclosure. Please see Appendix H for site photos.

APPENDICES

(

Appendix A—Permits

Borough of Rockaway One East Main Street Rockaway NJ 07866 (973)627-8035 5 (5) 8 (4.)



Date Issued: 11/09/2009

Permit #

09-00468

IDENTIFICATI	ON Block	45	Lot <u>20</u>	Quali	fier	
./30 ∴Nork Site	2 WALL ST		Contractor	Ground/Water Treatment & T		······································
	ROCKAWAY	BORO, NJ 07866	Address	P. O. Box 1174	V. FEE SUMMARY (O	ffice Only)
Owner in Fee	LUSARDI, 3	OSEPHINE		Denville, NJ 07834	1. Building	\$50.00
Address	98 ADDISO	N AVE	Telephone	(973) 983-0901	2. Electrical	\$81.00
	ROCKAWAY	r, NJ 07866	Lic. No. or		3. Plumbing	\$0.00
Telephone			Bidrs. Reg. Home Reg.		4. Fire Protection	\$0.00
Is hereby gran			or Exempti		5. Elevator	\$0.00
perform the fo	liowing wo	ork:			6. Pian Review _	\$0.00
[X] BUILDING	L] PLUMBING	"	****	7. Subtotal	\$131.00
[X] ELECTRICATION	_] FIRE PROTECTION] ASBESTOS ABAT	_] LEAD HAZARD ABATEMENT] DEMOLITION	8. DCA State Fee	\$1.95
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					12. Exemption	-\$131.00
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3. Utility ser	vices, includ	ing septic.				
4. Ali structu	iral framing,	connections, wall a	and roof she	athing and insulation; electric inspection shall take place afte	al rough wiring, panel	
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system. The installation of	e insulation i of any interio	nspection shall be p or finish material.	performed at	fter all other subcode rough in	spections and prior to	the
Additional re	equired inspe	ections for all subco	des of const	ruction, for other than one- a	nd two-family dwelling	s, are
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these requir	ements:			·		
May be issue	ction is requ ed. The final	ired for each applications include	able subcode the installa	e area before a final Certificate tion of all interior and exterior	e of Occupancy or App finish materials, seali	roval ng of
exterior joini	ts, mechanic	al system and any	other requir	ed equipment; electrical wiring	a, devices and fixtures	;;
plumbing pip accessibility,	if applicable	i nxtures; tests reque; and verification o	uirea by any if complianci	r provisions of the adopted suite with NJAC 5.23-3.5, "Posting	ocodes; Barrier Free I Structures".	
☐ A complete of	copy of relea	sed plans must be	kept on the	job site.		



Block

ELECTRICAL SUBCODE TECHNICAL SECTION



Qualification Code

D. TECHNICAL SITE DATA DESCRIPTION OF WORK

Date Received 11-09-009 Control # Date Issued Permit #

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ONTRACTORS NOTIFY THIS OFFICE CALL UTILITY DIG NO. 1-800-272-1000	•

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Home Improvement Contractor Registration No. or Exemption Reason (if applicable):	7		Light Poles	
Federal Emp. ID No. 01-0951095 FAX: (913) 993-0903	<u> </u>		Motors-Fract. HP	9779949775
B. ELECTRICAL CHARACTERISTICS	-		Emergency & Exit Lights	
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JOB-SUMMARY/Office/Use Only////////////////////////////////////		4.	Storable Pool/Spa/Hot Tub	1999999999
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Barrier-Free		100	AMP Service	200000000000000000000000000000000000000
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Final Cut-in-Card Date Issued		. ——	AMP Motor Control Center	100000000000000000000000000000000000000
Date: ////////////////////////////////////			KW Elec. Sign/Outline Light	100000 0000000000000000000000000000000
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TECHNICAL SECTION





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Date Issued Permit #

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1 White = Inspector Copy

2 Canary = Office Copy

U.C.C. F110HB3 (rev. 07/03)

3 Tag = Office / Other

Appendix B—Disposal Tickets



CWM Chemical Services, LLC A WASTE MANAGEMENT COMPANY P.O. Bux 200 1550 Balmer Rd. Model City, NY 14107 (716) 754-8231 (716) 754-0211

THIS IS AN INVOICE FOR CURRENT CHARGES.
PLEASE PAY AMOUNT INDICATED BELOW.

DUE UPON RECEIPT OR PER CONTRACT TERMS

ALL PAST DUE AMOUNTS WILL BEAR INTER-EST AT ONE AND ONE HALF PERCENT PER MONTH OR THE MAXIMUM RATE ALLOWED BY LAW, WHICHEYER IS LESS.

GROUND/WATER TREATMENT & TECH

ATTN: ACCOUNTS PAYABLE

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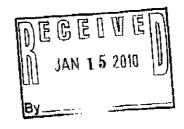
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website:www.wmdisposal.com EFFECTIVE 4-6-2009 OUR NEW DIRECT DIAL PHONE NUMBER IS 716 - 286 1550



IT TO **ADDRESS**

PO BOX 13648 PHILADELPHIA PA 19101-3648

PLEASE PAY THIS AMOUNT

\$2,154.85

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PREBLICLD CARIAGE INC.

P.O. BOX 5010 • FREEHOLD, NJ 07728-5010 (732) 462-1001 • FAX (732) 308-0924

DILL OF LADING FCI EPA ID NO. NJD054126164

\$ 222489

350 Pigeon Point Road New Castle, DE 19720 Phone: (302) 658-2005 Fax: (302) 658-6229

175 Bartow Mun. Airport Bartow, FL 33830 Phone: (863) 533-4599 Fax: (863) 533-1613

5533 Dunham Road Maple Heights, OH 44137 Phone: (330) 835-3473 Fax: (330) 835-3732

108 Monahan Avenue Dunmore, PA 18512 Phone: (570) 342-7232 Fax: (570) 342-7367

132 Myrtle Beach Hwy. Sumter, SC 29153 Phone: (803) 773-2611 Fax: (803) 773-2942

SHU	PER NAME/ADDRESS **	PHON	E			-, (01	5,712.700 7	rac jou	3) 773-2342 .	
K	ockney fough Welford Wellford Wall St, Rockney Top,	IAREA	CODE				1		111	
7	Wall St Cockway Two	TRAC	TOR	TRAILER		ν,	APPOINTMENT TIME			
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BRI	OKER!									
90	WOW.		N	IANIFES	1/(0)	() () ()	MENT NO. 🖒	O.J.		
(X) HM.	PROPER U.S. D.O.T. SHIPPING NAME	U.S. D.O.T. HAZARDOUS CLASS	NA/UN/NO.	PACKING GROUP	NO. CONT.	CONT. TYPE	NET QUANTITY	UNIT MEASURE	WASTE NO.	FORM
X	See Monter				1	CA	25,000	19	Foot	5
	2							<u> </u>	7 0	
	3		- -		·					
SPE	I HAL HANDLING INSTRUCTIONS INCLUDING CONT	AINER EXEMPTI	ON NUMBER.	<u>. </u>	<u> </u>	I.,		L	<u> </u>	<u> </u>
SHIP	PER'S CERTIFICATION: This is to certify that the a	bove named mate	rials are properly	classified, des	cribed, in	ackaoed	: marked and labeled a	nd are in	proper condit	ion for
i uturio	portation according to the applicable regulations of the d. The consignee can and will accept the shipment ar	u iaenammentar ()	CARCINOTISTICS III.	EUA and the	CANA The		de desseibed about all all		—	porter
Payn	ent to the contractor for waste removal does not constit							_	-	ered to
ale co	ntractor. SE PRINT NAME/TITLE		PPER'S SIGNATU			- 1 - 1 - 1	- Bree	EZOAD		9000000
	Kenteeus sa	Х			M)			23 /	
	11111 Zews 12		I HAVE READ THE ABO	VE AND UNDERST	AND AND A	GREE TO A	LL OF ITS CONTENT.	NO.	UAY	YPR
CON	NGNEE NAME/ADDRESS	PHONE	. · ·			·		······································		
C	WM	(AREA	· · · · · · · · · · · · · · · · · · ·							
Å	lodd Cify DY	TRACTO	9R :-	TRAILER			APPOINTMENT LIME			
FCI R	EP. UNLOADING (PRINT) PROCEI	DURE	EQUIP SPOTE	ress Equi	FEMO	(60%)	TIME AT CONSIGNER	Milita	THE THE ONLY	
	· .						4.			
COM	MENTS OR DELAYS AT CONSIGNEE	* .				1	ARRIVAL TIME EQUIPMENT USED	(OE)	ARTURE TIME	
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PLEA	SE PRINT NAME/TITLE	CON	SIGNEE SIGNATI	JRE	. S. J		, and a second	E UNEO)	(DED)	
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	CT-HW-307 2001-0PV-23 DE-HW-203 ME ME-HWT-47	35	ND. WH-429	OK	UPW-0	1907.13-	OH : [:44.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	: Wi 1	1602	
	DE-SW-203 ME-WOT-47	•	NH TNH-0047 NJ S-2265	PA	PA-AH-	0067	A-840943	· Wy:	JPW-0190713	HOH
	JPW-0190713-OH MI UPW-019071 AA-294 MN UPW-019071	o où	15939 NY NJ-113		EBEC, Ca RI-535		QC-8ML-047			

		O							
Ple	ase print or type. (Form designed for use on elite (12-pitch) typewriter.)	-				Form	Approved. Ol	MB No. 2050-0	0039
1	UNIFORM HAZARDOUS 1: Generator ID Number WASTE MANIFEST	2. Page 1 or	Emergency Response	Phone	4. Manifest				
	5 Constitute Name and Malling & 2012 DOG 55 4 1 1 5		Generator's Site Address (をする する 作剤がAintin	UU	<u> </u>	<u> 2238</u>	JUN	
	I IS KPA VEGTON II							-	
	2890 WOODBRIDGE AVE ATTN: ANDREW COLUMN	MFORTIN	II ROCKA 2 WAL		DROUGH N	BLLFL	ELD		
	Generator's Phone: 996-6827 6. Transporter 1 CompaniAvante* 996-6827	337			-	~ m <u>~ * *</u>			
$\ $	6. Transporter 1 Company Natrie 7		ROCKA	HAI I	AT IT'S ENVIOLE	full bish to to	····		
$\ $	7. Transporter 2 Company Name				U.S. EPA DA	00541	26161		
					U.S. CTAID :	Kumber			
	8. Designated Facility Name and Site Address CWN CHEMICAL SERVICE	ac 114	,		U.S. EPAID N	lumber			
	1550 BALMER RD CWM CREMICAL SERVICE	id, Lle							
	MODEL CITY NY 14107					NVISO	1983667	O.	
$\ $	Facility's Phone: 716-286-1550				1		EPWVVV.	7	
	9a. U.S. DOT Description (Including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if anyl):	*	10. Containe No.	11. Total Quantity	12. Unit Wt./Vol.	13. Was	ste Codes		
1	1	^~~	110.	Туре		 	1		
2	X 9, NA 3077, PG111)UZ ;	. 01	CM	Est 0	p	F002		
GENERATOR				,,,	<u> 42" </u>	-			
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	3.		<u> </u>			-			
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	4.								
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	14. Special Handling Instructions and Additional Information				•		. '		
	NJDEP S 2265 DECAL # 0662	2	NJ-113		-			••	
	APPROVAL # NY299793 SR #		•		•		-		
	15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this	is consignment a	re fully and accurately desc	ribed above	by the proper shi	pping name,	and are classifia	ed, packaged,	⊣
	marked and labeled/placarded, and are in all respects in proper condition for transport acc Exporter, I certify that the contents of this consignment conform to the terms of the attache	ed EPA Acknowle	edament of Consent.			if export ship	oment and I am t	the Primary	-
	I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a larg Gengrator's/Offeror's Printed/Typed Name		rator) or (b) (if I am e smali ature	quantity gen	erator) is true.		\$40alh	Davi Voc	
1	ANDIEW L. CONFORMY USERA		atulo				Month		
ŗ	16. International Shipments Import to U.S.	Export from U.	S. Port of entry	.davile			- /		-4
INL	Transporter signature (for exports only):		. Date leaving						
TRANSPORTER	17. Transporter Acknowledgment of Receipt of Materials Transporter 1 Printed/Typed Name	Clan							
POR	Indisposes (Limitar Maria	Signa 	anne }	λ . λ	. خرویا	À	Month	Day Yea	G
ANS	Transporter 2 Printed/Typed Name	Signa	ature	· *		77.4.	// // // // // // // // // // // // //	A / J/ / Day Yea	ar .
TR/					<u> </u>	·	1	LÍ	
1	18. Discrepancy								
	18a. Discrepancy Indication Space Quantity Type		Residue		Partial Reje	ction		Full Rejection	
	- I		Manifest Reference N	à unhar		i .	;-	. ,	
Ĕ	18b. Alternate Facility (or Generator)		Billings I Many of the	·	U.S. EPA ID N	umber			\dashv
걸									
ÜF	Facility's Phone: 18c. Signature of Alternate Facility (or Generator)				<u> </u>		Month	Deu Vo	
DESIGNATED FACILITY	too ognatio or rastrate i comy (or octoriate)						Month	Day Ye	285
SIGN	19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treat	atment, disposal,	and recycling systems)		······································				\dashv
ĕ	1. 2.	3.			4.				ᅱ
I									Ц
	 Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered Printed/Typed Name 		est except as noted in Item 1 ature	18a			Month	Day Yea	_
1		0''					17/0/110	-uj 100	- 1

ECD

FREEHOLD CARTAGE INC.

P.O. BOX 5010 • FREEHOLD, NJ 07728-5010 (732) 462-1001 • FAX (732) 308-0924

BILL OF LADING FCI EPA ID NO. NJD054126164

S 222314

350 Pigeon Point Road New Castle, DE 19720 Phone: (302) 658-2005 Fax: (302) 658-6229 175 Bartow Mun. Airport Bartow, FL 33830 Phone: (863) 533-4599 Fax: (863) 533-1613 5533 Dunham Road Maple Heights, OH 44137 Phone: (330) 835-3473 Fax: (330) 835-3732 108 Monahan Avenue Dunmore, PA 18512 Phone: (570) 342-7232 Fax: (570) 342-7367 132 Myrtle Beach Hwy. Sumter, SC 29153 Phone: (803) 773-2611 Fax: (803) 773-2942

SHIPPER NAME/ADDRESS	PHONE			3 4 1 1 1	, , , , , , , , , , , , , , , ,
ROCKHUM, Boro Well Rei	(AREA CODE)				
2 WALL ST.	TRACTOR	TRAILER	APPOINTMENT TIM		
POCKALWAY TWP.	11. 652				
FCI REP. LOADING (PRINT)	DURE EQUIP SPOTT	ED EQUIP REMOV	ED TIME AT SHIPPER	MUTARYTME	NEY
	2 F	1778	700.0	/ <u>(/</u> 3:4	
COMMENTS OR DELAYS AT SHIPPER			ARRIVAL TIME EQUIPMENT USED	DEPARTURE TH	
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Clearing.					
BROKER:				والمستويل ويسا	47
PO# WQ#	<i>752461</i> N	/ANIFEST/DC	CUMENT NO. ¿	ガラシマ	, မေျပ
PROPER U.S. D.O.T. SHIPPING NAME	HAZARBOUS CLASS NA/UN/NO.	PACKING NO.	CONT. NET	UNIT WASTE	2000203030
HM PROPER U.S. D.O.T. SHIPPING NAME	HAZARBOUS CLASS NA/UN/NO.	GROUP CONT.	TYPE QUANTITY	MEASURE NO.	FORM
NI SE WAAN	TOST	1 61	211/12/200		2
	Mario Co		(ES	7) '	
2					
3					
SPECIAL HANDLING INSTRUCTIONS INCLUDING CONT	TAINER EXEMPTION NUMBER.	<u> </u>			
CHICAGO CEDTICICATION. This is to continue that the	have a second se	-1- 27-171 9 1	<u> </u>	4.7	
SHIPPER'S CERTIFICATION: This is to certify that the a transportation according to the applicable regulations of the	 Department of Transportation: U.S. 	FPA and the State The	materiale described above u	rere conclaned to the Tre	menodor I - 1000
named. The consignee can and will accept the shipment at				· ·	
Payment to the contractor for waste removal does not censtill the contractor.	tute payment to the carrier and if the c	ontractor does not pay the	carrier, the shipper is obligate	ed to pay the agreed rate	offered to
PLEASE PRINT NAME/TITLE	SHIPPER'S SIGNATI	DE /		DATE LOADERT -)	
Hot Spenning Corn D	West X (EST			$/\gamma = -1$	
		OVEYAND UNDERSTAND AND AG	REE TO ALL OF ITS CONTENT.	MO DAY	YR.
CONSIGNEE NAME/ADDRESS	PHONE			1-1-1-1-1-	
	(AREA CODE)				
Lilia Oliva X	TRACTOR	TRAILER	AREOINTMENTERMI		
Model Lity,	<u> </u>	24000000000000000000000000000000000000		•	
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			ARRIVALTIME	DEPARTURE / IN	E
COMMENTS OR DELAYS AT CONSIGNEE			EQUIPMENT USED		
PLEASE PRINT NAME/TITLE: 1979. 1979. 1979. 1979.	CONSIGNEE SIGNAT	TURE (1. 10. 10. 10.	· · · · · · · · · · · · · · · · · · ·	DATE UNLOADED	
	x				
				MQ. DAY	Ϋ́Β
AR H-0257 MD HWH-167 CT CT-HW-307 2001-OPV-2	Ace		90713-OH 30 100-70-200	1 TX: 40705 - 1	
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DE-SW-203 ME-WOT-47	NJ S-2265	PA PA-AH-	0067	and a service of the	44 - 4 12 W \$
MA MA-294 MN UPW-01907			NADA QC-6ML-047		Pidipoleti (Markilla) Geografia (Markilla)

GENERATOR'S WASTE PROFILE SHEET

MDC NY299793

		ORIGINAL CWM MODEL C	ITY FACILITY	
	/B WASTE GENERATOR AND CUSTOMER INFORMATION			
1	. Generator Name: USEPA REGION 2	_ Generator USEPA ID	: NJX980654115	
2	. Generator Address: 2 NALL ST	_ Billing Address: (_) Same	GROUND/WATER TR	LEATMENT & TECH
	FORMER LUSARDI CLEANERS	- / Damo	PO BOX 1174	
_	ROCKAWAY TOWNSHIP NJ 07866	_		
3.	Technical Contact/Phone:			
4.	Alternate	- Billing	DENVILLE	NJ 07834
	Contact/Phone:	Contact/Phone:		_
C.	WASTE STREAK INFORMATION			
1a	Process Generating Waste: REMEDIATION OF SOIL ASSUMED TO BE	ASSOCIATED WITH FORM	IER DRY CLEANING O	D SD AGT ON
1,11	HASES NAME: SOIL WITH THIRACHLOROETHENE		The same of the same of	PARKETON
14	Color ; Strong Odor: (_); describe:			
1e	Physical State @ 70F; Solid(X) Liquid() Borb() Con()	f Single Laver (X) M	hilfilaver ()	
T.A.	rree ilq. range: to * Gravity: to Visco	sity: BTU/lb: _	to	
	. Sw. warde -110 co 214 or nor abbitchbie ()			
	Liquid Plash Point: < 73F (_) 73-99F (_) 100-139F (_) 140	-199F (_) >= 200F (]) N.A. (\overline{X}) Clo	seed Cup (X) Open Cup (_)
28	Is this a USEPA hazardous waste (40 CFR Part 261)? Yes (X)	жо (_)		
~~	Identify ALL USEPA listed and characteristic waste code numb			
25	Do underlying hazardous constituents (UHCs) apply (40CFR268.	4R) 2 (N)	_	Same as USEPA Codes
24	Is the waste predominantly debris subject to the Alternate no	ehria Stendarda(40 a	FR268.45)? (N)	
2£	Is the waste predominantly soil subject to the Alternate St. Does the waste contain asbestos? () If yes, is waste Friable	oil Treatment Standa	rds(40 CFR268.45)	? (전)
29	waste concains densené in concentrations	* NEGHABO! (-	
2h	is waste remediation from a major source of Haz Air Pollutant	ts (Site Remediation	NESHAP. 40CFR 63	subpart GGGGG 2 (x)
	1-0, does one waste contain 4340 blum Achard at the Do	Dint of determination	13 (")	Support Goods, Lin
21	waste contains PCBs (< >) ppm. regulated by	40 CFR 7612/ \	_	
	Are PCBs regulated under SIRS Mega Rule (40 CFR 761,61(a))	· (_)		
2 j	CHEMICAL COMPOSITION: List ALL constituents (incl. halogenat	ed organics) present	: in any concentr	ation and forward analysis
	Constituents SOIL	Reng		cription
	TETRACHLOROETHENE			
	ARSENIC	73.5 to		
	BARIUM		2.9 MG/KG 95.8 MG/KG	
	COPPER	50.8 to	50.8 MG/KG	
	LEAD TOTAL COMPOSITION (NUST EQUAL OR EXCEED 100%);	235 to	275 404	See attach2
			100.000000	
2k	Is the waste: Pyrophoric (_) Water-Reactive (_) Shock Sensit Other	ive (_) Oxidizer (_)	Carcinogen (_)	Infectious (_)
21	Is waste Group I wastewater or residual under Hagardons Organ	ic Nrshapp()		
Zm.	Boes the waste contain radioactive material? (N) Regulated by	NRC?() Ys radiosct	ive waste NORM?()
2n	Is the waste a CERCLA (40 CPR 300, Appendx B) or state mandato	ed cleanup? (N)		•
3a	This is a Nonwastewater.			
3e :	Physical Appearance: SOTL			
3f :	If waste subject to the land ban & meets treatment standards, Tracking Number: 5633125	check here: (Y) & st	mpply snalytical	results where applicable.
	DOT Information and Shipping Volume			
				
D1 1	Anticipated Anaual Volume: <u>25</u> Units: <u>TONS</u> PACKAGING: Bulk Solid (<u>X</u>) Bulk Liquid (_) Drum (_) Type/Size	Shipping Fre	equency: ONE TIME	_
	ERATOR'S CERTIFICATION			<u> </u>
I he	sreby certify that all information submitted in this and all a	ttached documents co	ntains true and	accurate descriptions of
rela	s waste. Any sample submitted is representative as defined in evant information regarding known or suspected bazards in the to obtain a sample from any waste shipment for purposes of re	40 CFR 261 - Appendi	T 1 1	
	neture on original evedile muconner	L CONFORTINI		
	Signature	·	and Title	

Edentify ALL Characteristic and Listed USEPA hazardous waste numbers that apply (as defined by 40 CFR 261). For each waste number, identify the subcategory (as applicable, check none, or write in the description from 40 CFR 268.41, 269.42, and 268.43).

यसव	A. US EPA HAZARDOUS Ente	simply check none			D. HOW MUST		
#				PERFORMANCE- BASED: Check as applicable		SPECIFIED TECHNOLOGY: If applicable enter the 40 CFR 268.42 table 1 treatment code(s)	MANAGED? Enter lette from below
		DESCRIPTION	NONE	268.41(a)	[268.43(a)	268.42	!
	F002		x	[L			D
2			<u> </u>	 			
3			<u> </u>			***************************************	
4			1 1	[]			<u></u>
5			1		<u> </u>		
6 <u></u>							<u> </u>
7							1
8							<u> </u>
9						V VIII.	<u> </u>
10			<u> </u>	<u>-</u>			<u> </u>
<u> </u>							!
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Management under the land disposal restrictions:

- A. RESTRICTED WASTE REQUIRES TREATMENT
- A.1 RESTRICTED WASTE REQUIRES TREATMENT TO ALTERNATE SOIL STANDARDS
- B.1 RESTRICTED WASTE TREATED TO 268.40 STANDARDS
- E.3 GOOD FAITH ANALYTICAL CERTIFICATION FOR INCINERATED ORGANICS
- B.4 DECHARACTERIZED WASTE REQUIRES TREATMENT FOR UNCS
- B.5 RESTRICTED WASTES TREATED TO ALTERNATE SOIL STANDARD
- B.6 RESTRICTED WASTES TREATED TO ALTERNATE DEBRIS STANDARD
- C. RESTRICTED WASTE SUBJECT TO A VARIANCE
- D. RESTRICTED WASTE CAN BE LAND DISPOSED WITHOUT FURTHER TREATMENT
- R. NOT CURRENTLY SUBJECT TO LAND DISPOSAL RESTRICTIONS

E.	TRANSPORTATION INFORMATION	112337
	a. Is this a DOT Hazardous Material? Yes X No	
	b. Proper Shipping Name	
	and Additional Description if required: (F002)	
	c. DOT Regulations: North America Hazard Class: 9 Misc. Hazardous Mat'l Y.D. NA3D77 Packing Group 2nd Haz Cls :	: III
	c. CERCLA Reportable Quantity (RQ) and units (Lb, Kg): 100 Lb	
	e. Non-Bulk code 213 Bulk code 240	
	f. Special Provisions <u>B54 IB8 IP2 T1 +++</u> See DOT Regs for more info	
	g. Labels Required CLASS 9	
F.	SPECIAL HANDLING INFORMATION	
	_ Material Safety Data Sheets Attached	
G,	OTHER INFORMATION	
-		
-		
-		
	CHEMICAL WASTE MANAGEMENT CERTIFICATION	
í	Themical Waste Management, Inc. has all the necessary permits and licenses for the waste that has been charac Edentified by this approved profile.	eterized and

ATTACHMENT 2

CHEMICAL COMPOSITION: Additional constituents NOT included Constituents		f the Waste Profile Unit Description
NICKEL		11.7 to 11.7 MG/KG
ZINC (NOT FUME OR DUST)	····	198 to 198 MG/KG
COMMENTS		to
more when the second second		

793

Generator Name:	USEPA REGION 2	Manifest Doc. No.:		
Profile Number:	NY299793	State Manifest No:		
code, identify treatment star must be listed	the corresponding subcatidards are listed on the i	ewater? (See 40 CFR 268.2) Check ONE: Nonwastewater X as that apply to this waste shipment, as defined by 40 agory, or check NONE if the waste code has no subcateg collowing page. If F039, multi-source leachate applies exator. If D001-D043 requires treatment of the characte (erlying hazardous constituent(s) present in the waste	CFR 261. Fo ory. Spent , those com	or each waste : solvent astituents
3. US EPA HAZARDOUS WF WASTE		4. SUBCATEGORY ENTER THE SUBCATEGORY DESCRIPTION. IP NOT APPLICABLE, SIMPLY CRECK NONE		5. HOW MUST
# CODE(S)		DESCRIPTION	T	BE MANAGED? ENTER LETTER
1 r002		DASCALFILOR	NONE	FROM BELOW
2		411-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1	<u>x</u>	D
	- 			
3				
1		hazardous constituent(s), use the *F039/Snderlying	ļ	
MUST THE WAST! waste must be letter 81, 83, anage the LDR latory citatic tions. RESTRICTED WAS This waste mus	BE MANAGED? In column 5 managed to comply with the B4, B5, B6, or D you are program may have regulated as differ, your certificate TE REQUIRES TREATMENT	sheck here	r E) below nderstand t w. (States d below. W instead of	that describe that if you en authorized b there these the 40 CFR
MUST THE WASTE WASTE WASTE WASTE MUST be letter B1, B3, anage the LDR latory citatic trions. RESTRICTED WAST This Waste mus For Hazardous RESTRICTED WAS "I certify und ation of the timmediately retained properlof the prohibi including the; GOOD PAITH ANA" I certify und of the treatmeresponsible for treatmeresponsible for treatmeresponsible constitution of the prohibi constitution of the present the prohibition of the treatmeresponsible for treatmeresponsible constitution of the prohibition of the treatmeresponsible for treatmeresponsible constitution of the prohibition of the prohibition of the present the presen	HE MANAGED? In column 5 managed to comply with the B4, B5, B6, or D you are program may have regulated as differ, your certificates differ, your certificates the treated to the applipations: "This hasardous of TE TREATMENT to be treated to the applipations: "This hasardous of TE TREATMENT TO PERFORMANCE or penalty of law that I reatment process used to apponsible for obtaining ty so as to comply with the ted waste. I am aware the possibility of fine and LYTICAL CERTIFICATION FOR ar penalty of law that I in the process used to support obtaining this informations to the process used to support obtaining this informations to despite which we have the process used to support the process th	above, enter the letter (A, B1, B3, B4, B5, B6, C, D of the land disposal regulations (40 CFR 268.7). Please use making the appropriate certification as provided beloway citations different from the 40 CFR citations listed the land disposal regulations that the control of the citations of the different from the 40 CFR citations listed the land of the land of the citations of the citations of the citations will be deemed to refer to those state citations cable treatment standards set forth in 40 CFR 268.40. The citation of the citation o	r E) below nderstand tw. (States do below. Was instead of sof 40 CFR tment technose individuas been operatification continuity to the sof technology of	that describe that if you en authorized by there these the 40 CFR to 268.45.* cology and operated and massible dilution, ology and operated and massible dilution, ology and operated the top
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Signature	Title		
	1990 Chemical Waste Management , Inc	08/99- Pore CM-2005-C	



GROUND/WATER TREATMENT & TECHNOLOGY, INC.

P.O. BOX 1174 DENVILLE, NEW JERSEY 07834 Phone (973)-983-0901 • Fax (973) 983-0903

Non HazardousBill of Lading

T (0)		or Lau	1118
Ship To:	Tilcon Mt Hope – Scale House/Recycling 625 Mt Hope Rd		

Attn:

Recycling - Kathleen

Wharton, NJ 07885

GWTT Ref: AECOM Rockaway Borough OU No. 4

Date Shipped: December, 2009

	Quantity	Unit		Weight
Item 1	10 (est)	Tons	Description Non-hazardous concrete/boulder	20,000-lbs





JON S. CORZINE Governor

State of New Jersey

DEPARTMENT OF ENGROPMENTAL PROTECTION Solid & Hazardous Waste Management Program P.O. Box 414 401 East State Street Trenton, New Jersey 08625-0414 Telephone: (609) 984-5950 Telecopier: (609) 633-9839 http://www.state.nj.us/dep/dshw

LISA P. JACKSON Commissioner

RECYCLING CENTER GENERAL APPROVAL FOR CLASS B RECYCLABLE MATERIALS FOR CONCRETE, BRICK, AND BLOCK

Under the provisions of N.J.S.A. 13:1E-1 et seq. and N.J.S.A. 13:1E-99.11 et seq., known as the Solid Waste Management Act and New Jersey Statewide Mandatory Source Separation and Recycling Act, respectively, and pursuant to N.I.A.C. 7:26A-1 et seg., known as the Recycling Regulations, this approval is hereby issued to:

Tilcon New York, Inc.

Facility Type:

Lot & Block Nos .:

Recycling Center for Class B Materials

Municipality:

Block 20001, Lot 5.1

Rockaway

County:

Morris

Facility ID No.:

133631

Permit No.:

CBG080002

This General Approval is subject to compliance with all conditions specified herein and all regulations promulgated by the Department of Environmental Protection (Department),

This General Approval shall not prejudice any claim the State may have to riparian land nor does it allow the registrant to fill or alter, or allow to be filled or altered, in any way, lands that are deemed to be riparian, wetlands, stream encroachment or flood plains, or within the Coastal Area Facility Review Act (CAFRA) zone or are subject to the Pinelands Protection Act of 1979, nor shall it allow the discharge of pollutants to waters of this State without prior acquisition of the necessary grants, permits, or approvals from the Department.

<u>June 18, 2008</u> Issuance Date

Anthony Fontaga, Chief

Bureau of Transfer Stations and

<u>January 22, 2013</u> Expiration Date

Recycling Pacilities

ATTN- Pat Honeywell

Appendix C—Compaction Testing

210 Maple Place

Keyport, NJ 07735

732-888-8308

FAX 732-888-8307

SOIL DENSITY TESTING

Report No1	Date <u>11-04-09</u>
CLIENT: GROUND WATER TREATMENT	Day Wednesday
PROJECT: 2 WALL STREET, ROCKAWAY, NJ	Weather Clear
LOCATION: RBBE	Temperature 45°
	<u> </u>

CONTRACTOR: GROUND WATER TREATMENT

Test No.	Location/Elevation	Fill Moisture %	In Place Dry Density PCF	Compaction %
1st Lift	30" below slab			
1	1st lift right	9.7	106.6	95.7
2	1st lift left	9.4	107.6	96.6
2nd Lift	30" below slab			
3	2nd lift right	7.5	107.0	96.1
4	2nd lift left	10.6	108.2	97.2
3rd Lift 3	30" below slab			
5	3rd lift right	9.8	107.2	96.3
6	3rd lift left	9.4	106.6	95.7
4th Lift 3	30" below slab			
7	4th lift right	9.8	107.0	96.1
8	5th lift left	10.1	107.8	96.8

Equipment Used: Soils Testing: Gauge Type <u>Dual</u> Model 3440 Mfg. Troxler S/N<u>1710</u>9 Test Procedure ASTM D2922

Material:

Type: Utility Sand

Specification Requirement:____ 95%

Optimum Moisture: 16.1% Proctor Value: 111.4 Test Procedure: ASTM D1557 Depth of Test: 6"

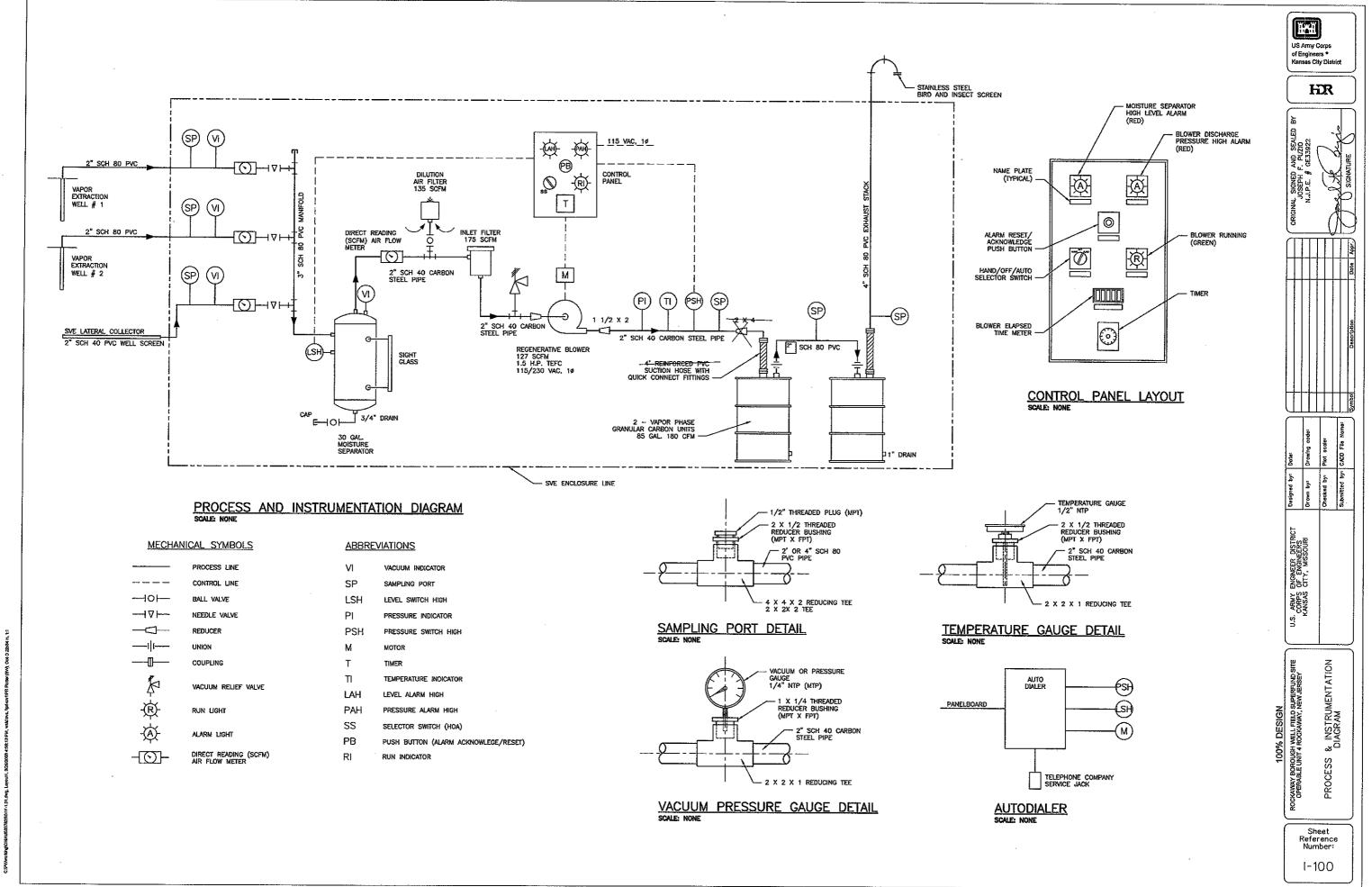
Remarks: Proctor supplied by Tilcon, NJ

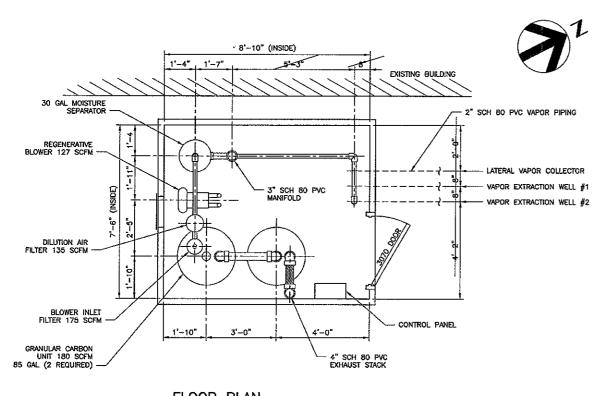
8 Lifts

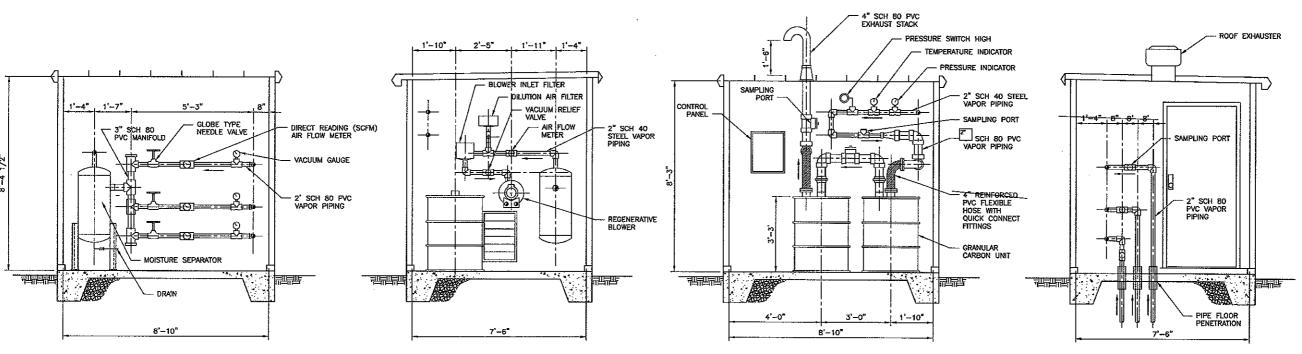
4" of 34 clean stone - 4" below asphalt

Inspector: R. Scarpellino Start: 8:00AM Finish: 4:00 PM

Appendix D—Red-Line As-Built Drawings







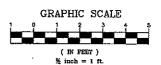
FLOOR PLAN
SCALE: 1/2" = 1'-0"

FLEVATION @ WEST WALL SCALE: 1/2" = 1'-0"

ELEVATION @ SOUTH WALL SCALE: 1/2" = 1'-0"

ELEVATION @ EAST WALL SCALE: 1/2" = 1'-0"

ELEVATION @ NORTH WALL SCALE: 1/2" = 1'-0"



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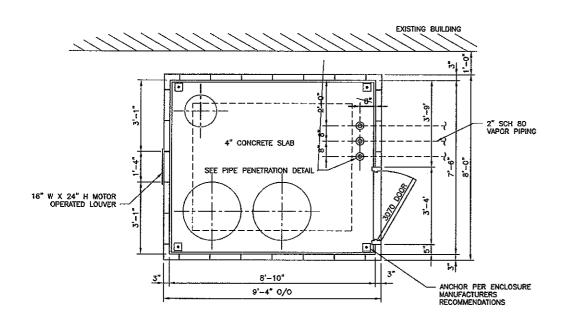
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U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS	KANSAS CITY, MISSOURI		

100% DESIGN
DOKAWAY BOROUGH WELL FIELD SUPERFUND SITE
OPERABLE LINIT 4 ROCKAWAY, NEW JERSEY
SVE EQUIPMENT ENCLOSURE
MECHANICAL PLAN AND
ELEVATIONS

Sheet Reference Number:

Reference Number:





CAULK ALL AROUND

SLIP RESISTANT EPOXY
RESIN FLOOR COATING

WWF 6X6-W10 X W10

COMPACTED 3/4"

CRUSHED STONE

WALL PANEL

BASE FLASHING

3 X 4 X 1/4 TUBE
SET ON 2 ROWS OF
CAULKING ALL AROUND

GRADE

COMPACTED 3/4"

CRUSHED STONE

WALL PANEL

BASE FLASHING

GRADE

4 1/2"

1'-0"

WALL PANEL

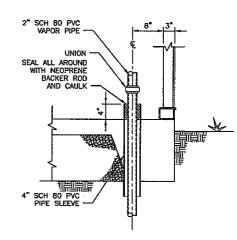
BASE FLASHING

4 X 1/4 TUBE
SET ON 2 ROWS OF
CAULKING ALL AROUND

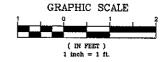
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ALL AROUND

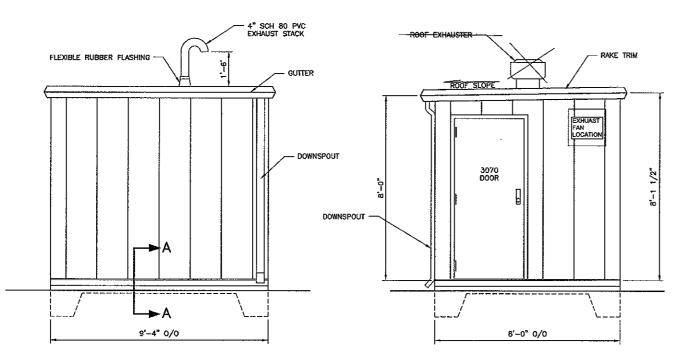
SECTION A-A



PIPE PENETRATION DETAIL
SCALE: 1" = 1"-0"

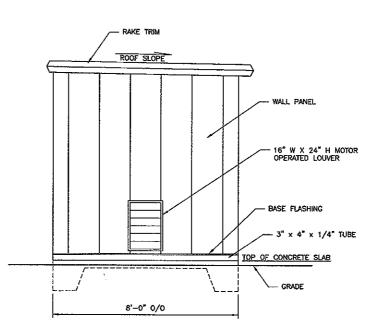


FLOOR PLAN SCALE: 1/2" = 1'-0"

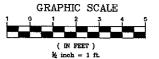


EAST ELEVATION SCALE: 1/2" = 1'-0"

NORTH ELEVATION
SCALE: 1/2" = 1'-0"



SOUTH ELEVATION SCALE: 1/2" = 1'-0"



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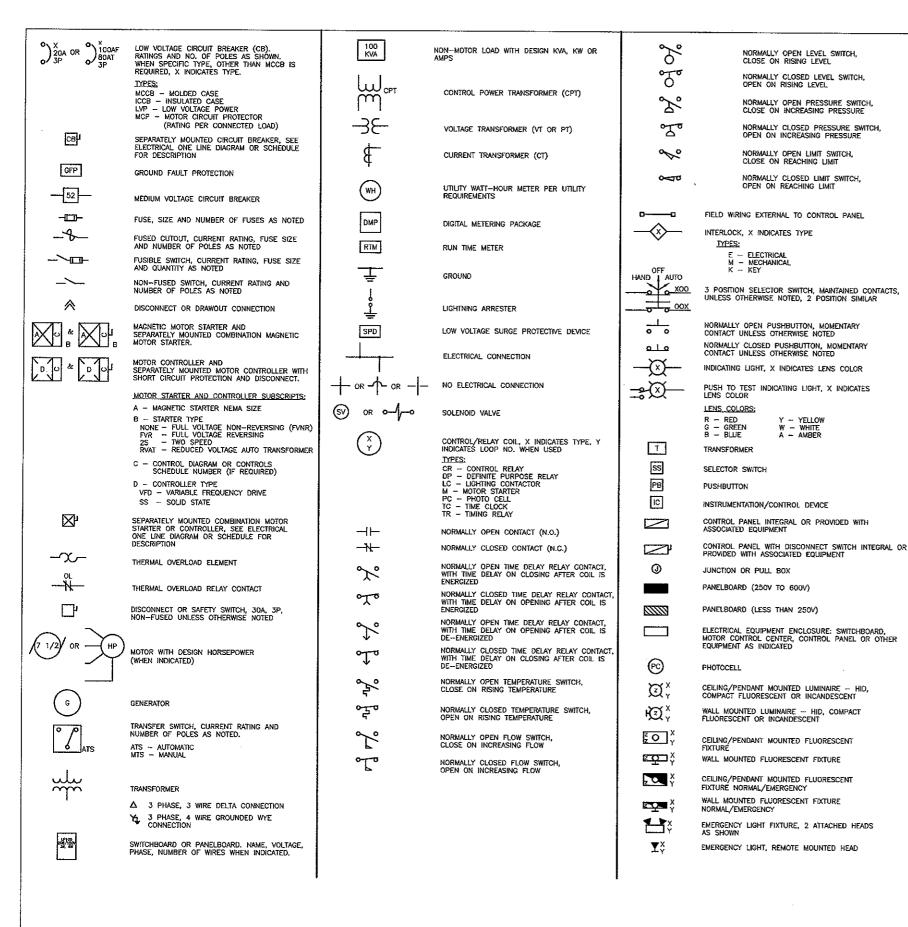
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 U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS	KANSAS CITY, MISSOURI		

NOW DESIGN
KAWAY BOROUGH WELL FIELD SUPERFUND SITE
OPERABLE UNIT 4 ROCKAWAY, NEW JERSEY
SVE, EQUIPMENT, ENCLOSURE

Sheet Reference Number:

A-100



⊕ [×] ⊚ [×]	DOUBLE FACED CEILING OR WALL MOUNTED EXIT LIGHT, DIRECTIONAL ARROWS (IF REQUIRED) AS INDICATED ON PLANS
⊘	SINGLE FACED CEILING OR WALL MOUNTED EXIT LIGHT, DIRECTIONAL ARROWS (IF REQUIRED) AS INDICATED ON PLANS
•-α _x	AREA OR ROADWAY LIGHT - POLE MOUNTED
~ĭ	LIGHTING FIXTURE SUBSCRIPTS;
	X - INDICATES FIXTURE TYPE PER LIGHTING
	FIXTURE SCHEDULE Y INDICATES CIRCUIT NUMBER FROM PANELBOARD z INDICATES CONTROLLING SWITCH (IF REQUIRED)
\$x	TOGGLE SWITCH
Ψ.Χ	SUBSCRIPTS;
	X INDICATES TYPE NONE NONE SINGLE BOLE
	NONE NONE — SINGLE POLE 3 — THREE-WAY 4 — FOUR-WAY
	HP — TOGGLE SWITCH, HORSEPOWER RATED K — KEY SWITCH
	TE - MANUAL MOTOR STARTER WITH THERMAL ELEMENT P PILOT LIGHT
	L LIGHTED HANDLE
	Y ~ INDICATES CONTROLLING SWITCH (IF REQUIRED)
H ()	SPECIAL PURPOSE RECEPTACLE AS DEFINED ON PLANS
	PLUG-IN RECEPTACLE STRIP, QUANTITY AND SPACING OF RECEPTACLES AS NOTED OR SPECIFIED
I ⊲	TELECOMMUNICATIONS OUTLET JUNCTION BOX
⊯ _Y ∽×	QUAD-DUPLEX RECEPTACLE, TWO NEMA 5-20R UNDER COMMON COVER PLATE.
₩Ŷ	DUPLEX RECEPTACLE, NEMA 5-20R
ЮΫ	SIMPLEX RECEPTACLE, NEMA 5-20R
	SUBSCRIPTS: X - INDICATES TYPE
	GFCI GROUND FAULT CIRCUIT INTERRUPTER Y INDICATES CIRCUIT NUMBER FROM PANELBOARD
	CONDUIT TURNING UP
	CONDUIT TURNING DOWN
	HOME RUN TO PANEL, 2 #12, 1 #12G IN 3/4°C UNLESS OTHERWISE NOTED
	CIRCUIT RUN BETWEEN DEVICES EXPOSED IN
	NON-ARCHITECTURALLY FINISHED AREAS, CONCEALED IN ARCHITECTURALLY FINISHED
	AREAS, CONDUIT AND CONDUCTOR SIZES SHALL BE THE SAME AS THE HOMERUN FOR THE
	CIRCUIT
	CONDUIT RUN BETWEEN DEVICES CONCEALED IN NON-ARCHITECTURALLY FINISHED AREAS OR
	UNDER FLOOR SLAB. CONDUIT AND CONDUCTOR SIZES SHALL BE THE SAME AS THE HOMERUN
	FOR THE CIRCUIT. CIRCUIT HASH MARKS (WHEN INDICATED), LONG,
	SHORT, SINGLE DOT AND DOUBLE DOT REPRESENT PHASE, NEUTRAL, EQUIPMENT
	GROUND AND ISOLATED EQUIPMENT GROUND RESPECTIVELY. #12 IN 3/4" CONDUIT UNLESS
	OTHERWISE INDICATED
	CIRCUIT CONTINUATION
	CONDUIT STUBBED OUT AND CAPPED
(xxx)	UNDERGROUND DUCT BANK NUMBER — WIRE AND CONDUIT SIZE AS SPECIFIED IN UNDERGROUND DUCTBANK SCHEDULE
FAA	FIRE ALARM ANNUNCIATOR
FACP	FIRE ALARM CONTROL PANEL
F	FIRE ALARM MANUAL PULL STATION
(CR)	FIRE ALARM CONTROL RELAY
Ě	FIRE ALARM CONTACT, FLOW SWITCH
(E)	FIRE ALARM CONTACT, TAMPER SWITCH
Š	
9	FIRE ALARM CONTACT, PRESSURE SWITCH

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ORGINAL SIGNED AND SEALED BY
JOSEPH F. PUZIO
N.J.P.E. # GE33922

ORIGINAL

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Checked by: Plot sode:

Submitted by: CAD File Name:

U.S. ARMY ENGINEER DISTRICORPS OF ENGINEERS
KANSAS CITY, MISSOURI

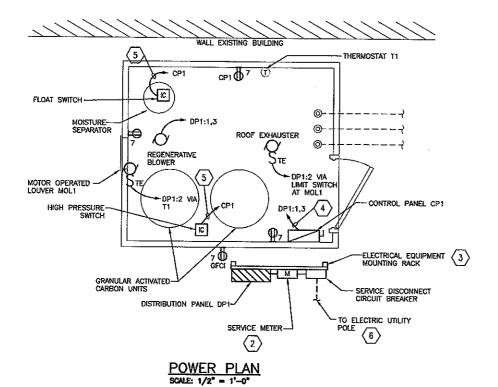
NIT 4 ROCKAWAY, NEW JEF CTRICAL SYMBOL

GENERAL NOTES:

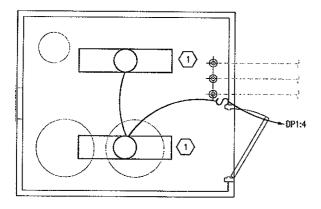
- THIS IS A STANDARD ELECTRICAL SYMBOLS SHEET. ALL SYMBOLS MAY NOT BE USED ON THIS PROJECT.
- SCREENING OR SHADING OF WORK IS USED TO INDICATE EXISTING COMPONENTS OR TO DE-EMPHASIZE PROPOSED IMPROVEMENTS TO HIGHLIGHT SELECTED TRADE WORK. REFER TO CONTEXT OF EACH SHEET FOR USAGE.
- SEE INSTRUMENTATION SYMBOLS SHEET FOR PROJECT SPECIFIC EQUIPMENT SYMBOLS, EQUIPMENT ABBREVIATIONS AND PIPING SYSTEM ABBREVIATIONS.

Sheet Reference Number:

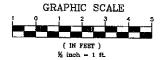
E-100



WALL EXISTING BUILDING



LIGHTING PLAN SCALE: 1/2" = 1'-0"



KEY NOTES:

- 2 PROVIDE SERVICE METER ENCLOSURE PER ELECTRIC UTILITY'S REQUIRMENTS.
- 3 SEE DETAIL FOR ELECTRICAL EQUIPMENT MOUNTING RACK ON SHEET 01E-D3.
- 4 3 #10, 1 #10G, 3/4°C.
- 5 3 #14, 3/4°C.
- $\overbrace{\mbox{5}}$ See drawing e-102 for site plan showing continuation of underground conduit to electric utility pole.

	PANELSOARD NO:	DP1														
VOLTAGE: 240/120 PHASE: 1 WIRE: 3+GND		240/120)	BUS RA	ATING ((A):				10	0		FNCLO	SURE:	NEMA 3R	
								MOUNTING RACK								
			THE PROPERTY						LOCAT	ION:	EXTERIOR					
	200% NEUTRAL:	NO SERVICE ENTRANCE LABEL: Y														
CKT	t .	CONE	ECTED	LOAD	(VA)	OÇF			0CP		CONN	ECTED	LOAD	(AV)	I	CK
	DESCRIPTION	LTS	REC	MECH	MISC	AMPS	Ρ		AMPS	P	LTS	REC	MECH	MISC	DESCRIPTION	NO
	CONTROL PANEL	\vdash			1,560	25	2	A	15	1			345		ROOF EXHAUSTER	7
	CP1				1,560	Į.		В	20	1	176				LIGHTS	74
	SPARE					20	1	A	20	1				T	SPARE	16
_	RECEPTACLES		720			20	1	В	20	1					SPARE	1.8
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11	SPACE .							В		╗			1		SPACE	1
13	SPACE						П	A		7				1	SPACE	12
15	SPACE	-						В	1	7					SPACE	11
	SPACE						П	A		╗					SPACE	12
19	SPACE	1						В		٦				1	SPACE	2
						LOA	D :	SU	MMARY	-			•		-	
		LTS	REC	MECH	MISC	SPAR	ΕĮ	T	JATO						PHASE BALANC	E
	NECTED LOAD (KVA)	0.2	0.7	0.3	3.1		i	-	4.4 240 LINE-T				O-LINE	VOLTS	PHASE A (KVA)	1
DEM	AND FACTOR	1.25	NEC	1.00	1.00	20%	ī	-		ı			TED AMP		PHASE B (KVA)	1
DES:	IGN LOAD (KVA)	0.2	0.7	0.3	3.1	0.9	T	-	5.3	ı	22	DESIGN	AMPS			

US Army Corps of Engineers ° Kensas City District

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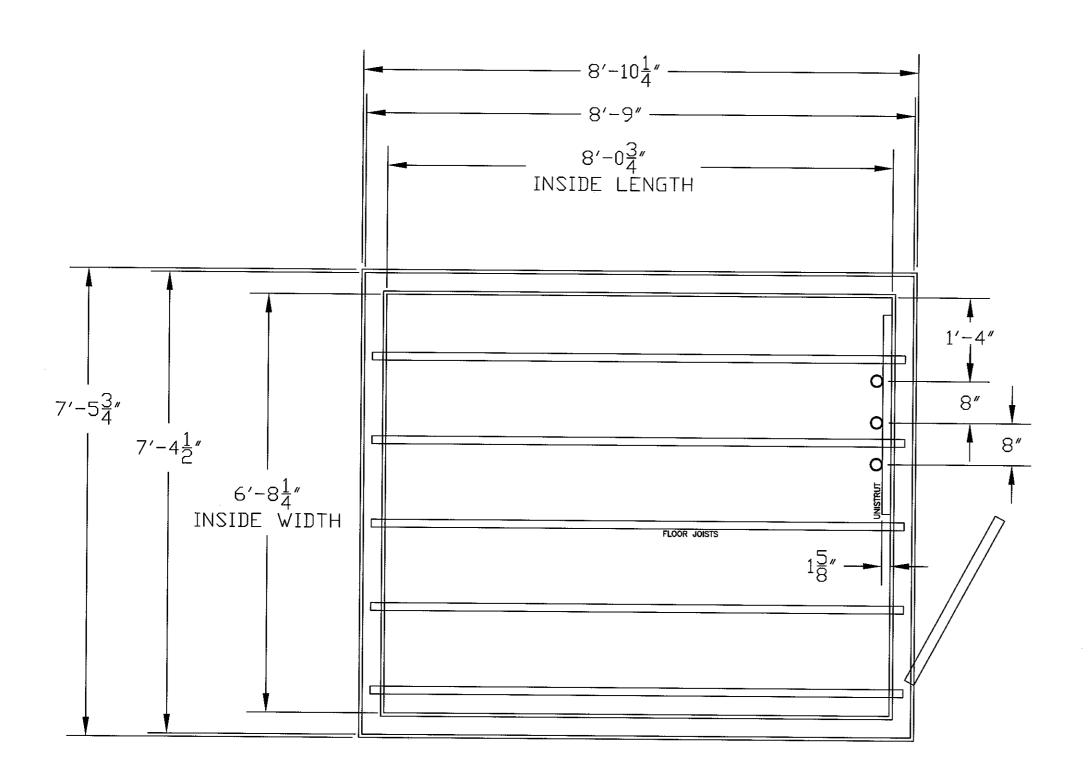
OVERABLE UNIT 4 ROCKAWAY, NEW JERSEY

LIGHTING AND POWER PLANS

Sheet Reference Number:

E-101

PIPE FLOOR PENETRATION LOCATIONS



Appendix E—Cistern Location



GROUND/WATER TREATMENT

PROBLET 264-1 (Sinnle Shade), 285-1 (Padded)

NOB ROCK BOR WELL FIELD OUN. 4 SHEET NO.

CALCULATED BY.... DATE_

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Appendix F—Commissioning Plan

The Soil Vapor Extraction System at Rockaway Borough Well Field- OU No. 4 was started on December 10, 2009 in Rockaway, NJ under the supervision of Pat Hunnewell of GWTT.

A Commission Plan was provided by GWTT in October 2009 and was followed throughout the start-up process. All of the steps were completed in the Pre-Commissioning Checklist that was given in the Appendix of the Commission Plan.



GROUND/WATER TREATMENT & TECHNOLOGY, INC.

P.O. BOX 1174 DENVILLE, NEW JERSEY 07834 Phone (973)-983-0901 • Fax (973) 983-0903

COMMISSIONING PLAN

This start-up procedure has been developed by Ground/Water Treatment & Technology, Inc. (GWTT) for the fabrication of the new Soil Vapor Extraction (SVE) system enclosure for the Rockaway Borough Wellfields Site located in Rockaway Borough, NJ.

This start-up procedure is separate from the operation and maintenance manual. It is provided as a guidance document to ensure the fabricated system was built in accordance with the project drawings and specifications and that the system is inspected and tested to meet the satisfaction of AECOM and the USEPA. This Commissioning Plan was based on information found in Specification Section 02 62 16.

As part of commissioning, GWTT shall complete the Pre-Commissioning Checklists and the Functional Performance Tests provided by HDR. Pre-Commissioning checklists for SVE System Piping, Air/Water Separator, Blower, SVS System Controls, Vapor Stream Treatment System, and Ancillary Equipment will be completed. GWTT will also ensure the execution of Functional Performance Test Checklists for SVE System Piping, Air/Water Separator, Blower, SVE System Controls, and Vapor Stream Treatment System. The checklists can be found in Appendix A and B, respectively, at the end of this Commissioning Plan.

1.1 OVERVIEW

The following is a step-by-step procedure, which will help ensure this system begins its operation successfully. GWTT and PLC have assembled this startup guide to help ensure common mistakes are prevented and to provide knowledge to our customers. This document cannot be expected to cover all possible startup conditions. Follow all standard safety procedures when following these instructions.

- a) Startup Date (Site in Rockaway, NJ): 12/10/09.
- b) Startup Location: Rockaway, NJ.
- c) Startup Person: <u>Pat Hunnewell, GWTT</u>.

1.2 CONTACT PERSON AT GWTT & PLC

If at any time you do not understand this procedure, or you would like additional information, do not hesitate to call GWTT or Product Level Control (PLC). When calling GWTT, please ask for Pat Hunnewell at extension 15 (973 983 0901) and reference project number 11 1655 AECOM Rockaway.

1.3 TOOLS REQUIRED

For start-up, the following tools listed below are required in addition to a typical tool set.

• Voltmeter

Rockaway Borough Wellfields Site Ground/Water Treatment & Technology, Inc.

November 2009 Commissioning Plan

- Clamp on amperage meter
- Telephone
- Flashlight

1.4 PHONE LINE HOOKUP

The hook-up of the phone line will be completed on site during testing and verification on site in Rockaway. Once the line is run, the following steps will be followed:

- Verify the phone service is operating properly by connecting a telephone to the incoming phone line and making a phone call. Note that some customers put long distance blocks on the telephone service.
- Connect the phone line to the control panel. Labels inside the control panel will guide you to this connection.
- Auto dialers require setup. GWTT will refer to the existing auto dialer's operation and maintenance manual for setup instructions.

1.5 POWER HOOKUP

GWTT ran the wiring from the power source to the system. The following steps will be followed for permanent power.

- The disconnect switch inside of the system's control panel is to remain off. Do not turn disconnect on until supplied voltage is verified as described below.
- Inside of the system's control panel, verify supplied power agrees with the system's electrical prints and labels inside of the panel. If a neutral termination is present in the control panel, be sure the neutral wire has been run from the power source to this termination.
 - o Record voltage readings across all phases:
 - (a) A B voltage = $\underline{238}$
 - **(b)** A ground voltage = $\underline{119}$ (Generator)
 - (c) B ground voltage = 119
 - (d) Above voltages should be within 10% of each other and also within 10% of requirement.

1.6 OVERLOAD SETTINGS

Normally every motor has an overload relay located inside the control panel. Overloads are designed to trip when a motor draws more amps than the motor is designed for. Verify each overload setting matches each motor's full load amperage as indicated on the motor's nameplate. Note that most motors are rated for more than one voltage so be sure you are reading amperage on the motor nameplate as it relates to the supplied voltage. (12A OK)

1.7 EXTERNAL PIPING HOOKUP

(OK)

Confirm all inlet and outlet piping assemblies are connected to the system properly and also make sure all valves external to the system are set properly. Once connected in the field in Rockaway, GWTT will install the permanent pipe and fittings. Start-up and prove-out will still be completed using

ambient air, but through the dilution port on the regenerative blower inlets. The discharge will be vented through the two 200-lb vapor phase carbon adsorbers operated in series.

1.8 FREEZING CONDITIONS

(OK)

Freezing conditions or conditions where freezing has occurred recently can cause problems. Ice in pipes will restrict flow and may cause extreme pressure or vacuum levels that can cause equipment failure. Verify assemblies in the system do not have ice present. Verify piping outside of the system does not have ice present. Ice blockages in exterior piping can cause catastrophic equipment failures.

1.9 VALVE SETTINGS

(OK)

For this SVE system with one regenerative blower, during start-up testing in Rockaway:

- Open all valves in system except for sample ports and relief valves. Valves to open include: all ball valves and gate valves including the bleed air dilution valve.
- Do not open manual tank drain valves.

1.10 TURNING POWER ON

(OK)

- Position all Hand-Off-Auto (HOA) selector switches to Off position. See HOA descriptions below
 - o Hand, H: motors will run, all operating and safety switches are ignored.
 - o Off, O: motors will not run, all operating switches are ignored.
 - o Auto, A: motors will run according to operating switches and system logic.

Power up the control panel by switching the disconnect in the panel to the On position.

1.11 MOTOR ROTATION

(OK 1-Phase)

Correct motor rotation is extremely important. To check rotation during the field test:

- Read and understand all operating instructions for each piece of equipment. Follow the manufacturer-supplied instructions to verify all pieces of equipment are ready for operation.
- If the system includes an Emergency Stop button (E Stop), make sure this red knob is pulled out. System will not operate if Emergency Stop is pushed in.
- Verify all motors are rotating in the correct direction by momentarily turning each HOA switch to Hand and watching their rotation.

1.12 HEATER AND EXHAUST FAN (Ambient tap too low to test fan)

Verify the exhaust fan starts when the exhaust fan thermostat is set at a temperature below ambient. Make sure the exhaust fan stops when the thermostat is set at a temperature above ambient. Verify the heater starts up when the heater thermostat is set at a temperature above ambient. Make sure the heater shuts down when the thermostat is set at a temperature below ambient.

1.13 SWITCH SETTINGS

GWTT and AECOM will locate all system switches in the system, using the final P&ID to confirm their location/presence. Typically, these can be pressure, vacuum, level or temperature switches. GWTT will set these switches in positions that we believe to be correct based on anticipated run conditions. These settings can be changed later. Some level switches include legends at the switch to indicate proper position. Verify these switches are installed according to the legend. (OK)

1.14 CONTROL PANEL LOGIC

The control panel tells the system how to operate. It is important to understand the logic. Read the attached Alarm Interlock Schedule and Sequence of Operations. It is common for operators to believe the system is malfunctioning while in fact it is operating as designed. **(OK)**

1.15 SYSTEM OPERATION

The system is now ready to be operated.

- Start system by placing all HOA selector switches in Auto and then press and release the Reset button.
- System should now be operating.
- Inspect system as it operates and listen for abnormal noises or vibrations.
- Adjust bleed air dilution valves on the SVE system to bring pressure levels to desired operating conditions.

1.16 VOLTAGE

With the regenerating blower motor operating, record voltage readings across each leg and document in the chart below. Fluctuating or decreased voltages cause system performance issues and damage to motors.

Field Test – Rockaway, NJ

Date/Time	A-B	A-Ground	B-Ground
12/10	216	107	108

1.17 AMPERAGE

While the motor is operating, record amperage values on each phase.

- Typically, amperage readings are taken inside of control panel.
- Take amperage readings from each leg of each motor and record in chart below.
- Compare amperage readings to motor nameplates.

Field Test, Rockaway, NJ

Motor	Nameplate Amps	L1 amps	L2 amps	
Regen Blower	12	9	9	

1.18 SWITCH OPERATION

While system is operating, manually adjust each switch one at a time to cause fault conditions. These switches include pressure, vacuum, temperature and level. Verify system responds properly according to the system's logic.

1.19 COMBUSTIBLE ORGANIC VAPOR MONITORING

After opening the valves to begin extracting air from each extraction well for the first time, GWTT will monitor the following time intervals: 0-1 minute, 30-45 minutes, 60-75 minutes, 120-135 minutes. Monitoring shall be performed upstream from the activated carbon in the combined piping manifold. If the flame ionization detector shows that the vapor stream has reached 5000 ppmV as isobutylene, GWTT will make adjustments right away to decrease the organic vapor level. Such adjustments may include increasing and/or decreasing airflow rates from selected wells. The monitoring and adjustment procedure shall be repeated until the organic vapor level of the vapor stream has been decreased to less than 5000 ppmV as isobutylene.

APPENDIX A

PRE-COMMISSIONING CHECKLISTS

Pre	-commissioning checklist - Piping								
For	SVE System Piping								
Che	cklist Item	Q	М	E	т	Ċ	D	0	υ
Ins	tallation								
a.	Piping complete.	<u>x</u>		х		x			
b.	Piping flushed / cleaned.	x		х		х		-	
c.	Leak testing complete (except for joints that have to be tested while the blower is operating).	x		x		x			
d.	Valves installed as required.								
e.	Heat tracing installed as required.					X			
f.	Piping insulated as required.	N/Z							
g.	Thermometers, gauges, sampling ports, and monitoring ports installed as required.	d				x			
i.	Verify operation of valves.								
j.	Flexible connectors installed as required.	<u>x</u>				x			
k.	Verify that piping has been labeled and valves identified as required.	X		x					
1.	If potentially flammable organic vapors will be extracted, verify that piping is properly grounded	N/P							
m.	As-built shop drawings submitted.			x		x			
Test	ing, Adjusting, and Balancing (TAB)								
a.	Monitoring ports and airflow monitoring devices installed and properly positioned.	<u>x</u>		x		x			

Pre-commissioning Checklist - Air / Water Separator

For	Air / Water Separator Unit: []								
Che	cklist Item	Q	M	E	Т	C	D	0	U
Ins	tallation								
a.	Leak testing complete.	<u>X</u>		X		х			
b.	Valves installed as required.	X		х	x	x			
c.	Verify operation of valves.	<u>X</u>		х	x				
d.	Verify that piping has been labeled and valves identified as required.	<u>x</u>		x	x	х			
e.	Condensate drainage is unobstructed. (Verify by draining water from collection vessel of air / water separator).			x	x	х			
Pre	-commissioning Checklist - Blower								
For	Blower Unit: []								
Che	cklist Item	Q	M	E	T	С	D	0	U
Inst	tallation								
a.	Vibration isolation devices installed [as freed to float with adequate movement and seismic restraint] as specified.			x	х	x			
b.	Casing undamaged.	X		Х	х	х			
c.	Silencers undamaged.			Х	x				
đ.	Proper belt tension, if belt driven.		·	x	x	x			
e.	Protective covers over rotating equipment.	<u>x</u>		x	X	x			
f.	Manufacturer's required maintenance clearance provided.	<u>x</u>		x	х	x			
g.	Spare inlet air filters present on-site.	NO		x	X.	x			
h.	Pressure/temperature gauges installed.	<u>X</u>		X					
i.	Verify proper installation of air cooling equipment, for cooling blower exhaust, if used.	<u>N/2</u>	<u></u>	х					_
j.	Verify that special tools and spare parts are present on site.								
Chec	eklist Item	Q	M	E	Т	C	D	0	Ü

(Generator)

Ele	ctrical						
a.	Power available to unit disconnect.			x		 	
b.	Fower available to unit control panel.			x		 	
c.	Control system interlocks functional.			x		 	
d.	Motor and blower rotation checked.			x	x	 	
e.	Verify that power disconnect is located within sight of the unit it controls.			x		 	
f.	Grounding properly installed.			x		 	
Con	trols						
а.	Control valves/actuators properly installed.	N/A	x _			 	
b.	Control valves/actuators operable.	<u>N/A</u>	x _			 	
c.	Control interlocks properly installed.	<u>x</u>	x	x		 	
d.	Control interlocks operable.	<u>x</u>	X	Х		 	
Tes	ting, Adjusting, and Balancing (TAB)						
a.	Construction filters removed and replace	$\frac{N/A}{-}$	x		x	 	
b.	Pressure/temperature gauges installed.	<u>X</u>	х _		x	 	

Pre-	-commissioning Checklist - SVE System Cont	trols	3						
For	SVE System: []								
Chec	cklist Item	Q	M	E	т	С	D	О	Ū
Inst	allation								
a.	As-built shop drawings submitted.			X,	х				
b.	Layout of control panel matches drawings	<u>x</u>		x	x				
d.	Components properly labeled (on inside aroutside of panel).	nd <u>X</u>		x	x				
e.	Control components piped and/or wired to each labeled terminal strip.	<u>x</u>			x				
g.	Control wiring and tubing labeled at all terminations, splices, and junctions.	<u>x</u>		·-···	х				
i.	Shielded wiring used on electronic sensors.	N/I	<u> </u>		х		_		
Mair	Power								
a.	Power available to panel.	_X_			х				

Pre-commissioning Checklist - Vapor Stream Treatment System									
For	Vapor Stream Treatment System: []								
Che	cklist Item	Q	M	E	T	С	D	0	υ
Ins	tallation								
a.	Piping complete.	<u>X</u>		x		x			
b.	As-built shop drawings submitted.			x		x			
c.	Leak testing complete.	<u>X</u>		x		х			
e.	Valves installed as required.	<u>X</u>		x		x			
f.	Piping insulated as required.	<u>N/</u> A	<u></u>	x		Х			
g.	Thermometers, gauges, sampling ports, an monitoring ports installed as required.			x					
h.	Verify operation of valves.	<u>X</u>		x					
j.	Flexible connectors installed as required.	<u>x</u>		x	х	x		***	
k.	Verify that piping has been labeled and valves identified as required.	X		x					
j.	Verify use of flexible lines and connect for changing positions of lead, lag, and spare vessels, as required.	ors X		x	x	х			
ı.	Spare vessel on-site, if required.	<u>N/</u>	<u>A</u>	x	x	х			
m.	Verify status of air pollution control permit, if required	N/P	Α	X	x	x			
Pre	-commissioning Checklist - Ancillary Equi	pment							
For	SVE System: []								
Chec	cklist Item	Q	M	E	Т	C	D	0	Ų
Inst	Installation								
a.	Field monitoring instruments calibrated.	<u>X</u>				х			
b.	Lighting installed and functional.	<u>X</u>	x		х				

APPENDIX B

FUNCTIONAL PERFORMANCE TESTS CHECKLISTS

Functional Performance Test Checklist - Piping

For SVE System Piping

1. Start blower.

- 1. Functional Performance Test: Contractor shall verify operation SVE system piping as per specification. The following shall be verified while the blower is operating:
- a. Check vacuum response at each SVE wellhead before and after valving on each well.
- b. With the valves to all SVE wells in the open positions, gradually modulate the inlet bleed valve from fully open position, adjusting toward the fully closed position.
- c. As wells are valved on, leak-test joints not previously tested. Also leak-test accessible portions of SVE wells and pressure monitoring points. Note the locations of any leaks.
- 2. If piping system includes drainage points, check for water at drainage points at the end of each day during commissioning.
- 3. Independent measurement of air flow rates (from each extraction well, and total extraction airflow rate) by Contractor and TAB specialist. Results differ by no more than 10%.
 - 4. Verify operation of heat tracing.
- 5. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Contractor's Chief Quality Control Representative

Contractor's Mechanical Representative

Contractor's Electrical Representative

Contractor's Testing, Adjusting and Balancing Representative

Contractor's Controls Representative

Contracting Officer's Representative

Using Agency's Representative

Functional Performance Test Checklist - Air / Water Separator

For Unit: [____]

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Functional Performance Test Checklist - Air / Water Separator	
For Unit: []	
a. Check inlet and outlet connections for any signs of leaks. Note the	ي
locations of any leaks. (None)	•
b. Check pressure drop across air / water separator:	
Inlet pressure psig (N/A)	
Outlet pressure psig	
c. If equipped with a sight glass, check for unobstructed view of water level. (OK)	-
d. Compare airflow rate and pressure drop to contract specifications, and manufacturer's performance specifications.	
CONTRACT MANUFACTURER'S RANGE ACTUAL	
Airflow Rate (cfm) (90)	
Inlet pressure (psig) (17 in. H	20
Outlet pressure (psig)	
2. Turn blower off.	
a. Check operation of drain valve for condensate holding vessel.	
b. Check setting of high level alarm in condensate holding vessel.	
 c. If the unit is designed to allow the drain valve to be used while the blower is operating, check operation of drain valve for condensate holding vessel while the blower is operating. (N/A) 3. Unusual vibration, noise, etc. 	
(NONE)	
(MOINE)	_
4. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications. Signature and Date	
Signature and bace	
Contractor's Chief Quality Control Representative	_
Contractor's Mechanical Representative	-
Contractor's Electrical Representative	_
Contractor's Testing, Adjusting and Balancing Representative	-
Contractor's Controls Representative	
Contracting Officer's Representative	

Rockaway	Borough	Well	Field	Superfund	Site

KCUSACE

Functional	Performance	Test Checklist	- Air / 1	Water Separator	
For Unit: Using Agend	[] cy's Represen	ıtative			

Functional Performance Test Checklist - Blower
For Blower Unit: []
1. Functional Performance Test: Contractor shall verify operation of blower as per specification. The following shall be verified after the blower has been operating for a minimum period of [30] [] minutes:
a. Record current draw from blower, and voltage.
Amperage Voltage
b. Record blower air flow rate and air temperatures.
Air flow rate $\frac{(90)_{\text{cfm}}}{\text{Outlet air temperature}}$ degrees F Outlet air temperature $\frac{(83)}{\text{degrees}}$
c. Record blower fan speed. X rpm
d. Check noise level [decibels at 1 meter][]
e. Verify operation of variable speed (if equipped). N/A
f. Verify setting of vacuum relief valve. (4in.Hg)
g. Verify setting of pressure relief valve. N/A
h. Verify setting of high-temperature shutdown. N/A
2. Plot test readings of pressure and airflow rate on blower curve, compare results to manufacture's specifications, and submit testing, adjusting, balancing (TAB) report. TAB results within acceptable ranges.
3. Unusual vibration, noise, etc.
4. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.
Signature and Date
Contractor's Chief Quality Control Representative
Contractor's Mechanical Representative
Contractor's Electrical Representative
Contractor's Testing, Adjusting and Balancing Representative

Rockaway Borough Well Field Superfund Site	KCUSACE
Contractor's Controls Representative	
Contracting Officer's Representative	
Using Agency's Representative	

Functional Performance Test Checklist - SVE System Controls
For Control Unit: []
1. Functional Performance Test: Contractor shall verify operation of SVE controls as per specification. The following tests shall be performed:
a. Verify that controller is maintaining the set point by manually measuring the controlled variable with a thermometer, differential pressure gage, etc.
b. Verify sensor/controller combination by manually measuring the controlled medium. Take readings from control panel display and compare readings taken manually. Record all readings.
Sensor
Manual measurement Panel reading value
c. Verify that interlocks function in accordance with specifications.
d. Verify interlock with other SVE controls.
2. Verify that operation of control system conforms to that specified in the sequence of operation.
3. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.
Signature and Date
Contractor's Chief Quality Control Representative
Contractor's Mechanical Representative
Contractor's Electrical Representative
Contractor's Electrical Representative Contractor's Testing, Adjusting and Balancing Representative
Contractor's Testing, Adjusting and Balancing Representative

Rockaway	Borough	Well	Field	Superfund	Site
Mochanay	DOLOUGH	MCTT	TTCTU	Paperraia	DICE

KCUSACE

Functional Performance Test Checklist - SVE System Controls
For Control Unit: []
Functional Performance Test Checklist - Vapor Stream Treatment System
For Vapor Stream Treatment Unit: []
1. Functional Performance Test: Contractor shall verify operation of the Vapor Stream Treatment System as per specification. The following shall be verified while the system is operating:
a. Check inlet and outlet connections for any signs of leaks. Note the locations of any leaks.
b. Check airflow rates at inlet and outlet of vapor stream treatment system:
Inlet Airflow Rate $\frac{(90)}{(N/A)}$ cfm cfm
C. Check temperature and pressure across [lead treatment vessel] []: Inlet pressure
CONTRACT MANUFACTURER'S RANGE ACTUAL Inlet airflow rate (cfm) Inlet temperature (degrees F) Inlet pressure (psig) Outlet airflow rate (cfm) Outlet temperature (degrees F) Outlet pressure (psig) Pressure drop across lead vessel (psig) Pressure drop across lag vessel (psig) f. Using a [flame ionization detector] [], check organic vapor level readings of the vapor stream at the following locations:
Inlet of Vapor Stream

Functional Performance Test Checklist - Vapor Stream Treatment System
For Vapor Stream Treatment Unit: [] Treatment System (ppmV as [isobutylene] []) Between Lead and Lag
Vessels(ppmV as [isobutylene] [])
Outlet of Vapor Stream
Treatment System (ppmV as [isobutylene] [])
2. Unusual vibration, noise, etc.
3. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.
Signature and Date
Contractor's Chief Quality Control Representative
Contractor's Mechanical Representative
Contractor's Electrical Representative
Contractor's Testing, Adjusting and Balancing Representative
Contractor's Controls Representative
Contracting Officer's Representative
Using Agency's Representative
End of Section

Appendix G—Operation and Maintenance Manual

GWTT followed the guidelines previously provided in the Operation and Maintenance Manual for the system components.

Operation and Maintenance Manual

prepared by:

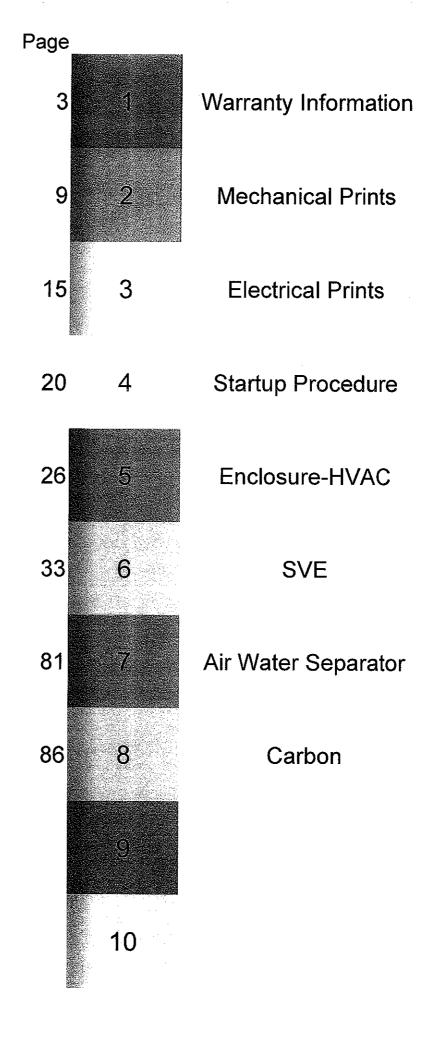
Product Level Control

PLC Project # 09-047

ENVIRONMENTAL EQUIPMENT & CONTROLS

11929 Portland Ave. South | Burnsville. MN 55337 Ph. 952-707-9101 | Fax. 952-707-1075 www.productlevel.com

Rockaway Borough
Well Field Superfund Site
Operable Unit 4
Rockaway, New Jersey





11929 Portland Ave. South Burnsville, MN 55337 Tel: 952-707-9101 Fax: 952-707-1075 www.productievel.com

TERMS AND CONDITIONS OF SALE

PREFACE

Product Level Control, Inc. (PLC) is the preferred supplier for environmental equipment, instrumentation and controls. Its ten-plus year history is based on producing high quality products and services at competitive prices. PLC prides itself on strong working relationships with its clients. PLC recognizes that long-term partnerships are based on interdependency. We work hard to produce you a high quality, high reliability, cost effective product, delivered when you need it. You expect to be treated fairly and respectfully, as do we. We have created these terms and conditions to offer clarity of how we do business. We wish to build long-term partnerships and avoid ambiguities.

GENERAL

All sales by Product Level Control, Inc. ("PLC") are made only under the terms and conditions set forth herein and terms and conditions of any purchase order submitted by the BUYER shall be of no force and effect, regardless of any provision to the contrary. PLC's failure to take exception to the terms and conditions embodied in any purchase order submitted by the BUYER shall not be deemed to waive the above provisions unless a written agreement exists between PLC and the BUYER, which is duly signed by both parties. Trade custom and/or trade usage is superseded by these Terms and Conditions and shall not be available in the interpretation of these Terms and Conditions.

PAYMENT TERMS

30%	Down payment. Releases production.
30%	Due prior to shipment with in 30-days of shipment*
40%	Due in 30-days

^{*} BUYER may deduct 2% of final 40% if paid within 10 days.

Finance charges

4 4 / 0 /	
111/2%	Monthly finance charge for all past due balances
1 /2 /0	I MONUNY IMANCE CHARGE TOF AIR DAST QUE DAIANCES

Security Agreement

By signing a purchase order with PLC, BUYER specifically acknowledges it is executing a Security Agreement granting PLC a security interest (including a Purchase Money Security Interest) in the goods ordered more specifically described in the purchase order, and expressly consents to PLC filing a financing statement (UCC-1) to this effect in the appropriate filing office of the BUYER's state as PLC deems necessary and taking such other necessary actions to perfect such a security interest.

Collection Fees

PLC may add to the balance any collection costs and/or legal costs associated with collecting past due balances.

Placing an order with Product Level Control (PLC)

- Upon receipt of the BUYER's Expression of Intent that PLC has been selected for the project, PLC will:
 - a. Proceed with the necessary system/equipment drawings (i.e. mechanical schematics, layout drawings, process and instrumentation drawing,, electrical control diagrams) and submit these to the BUYER for review and approval.
 - b. Send an invoice for required initial 30% payment.
- Once the BUYER has approved the design, issued written authorization to proceed subject to these Terms and Conditions (e.g. purchase order) and PLC has received initial payment of thirty percent (30%) of the total project cost is received, PLC will work with the BUYER on scheduling a ship date and begin production.
- 3. The BUYER will be required to pay second payment of 30% of the total project cost to release shipment to BUYER.
- 4. PLC will coordinate the shipment on behalf of BUYER and invoice for the remaining balance of 40% upon shipment. Payment is due within 30 days. BUYER may deduct 2% of the final 40% if paid within 10 days.

SHIPMENT

PLC will make equipment available F.O.B. PLC's location Burnsville, Minnesota. The estimated shipment schedule provided in the quotation is based on current production scheduling. A more definite shipment date will be established by PLC upon receipt of the BUYERS purchase order (or written agreement to proceed), receipt of initial 30% payment, and approval of technical drawings.

All shipping schedules are approximate and PLC is not liable for any damages or extra costs for failure to meet shipping schedules.

TRANSPORTATION CLAIMS

Responsibility of PLC for proper delivery ceases upon delivery of the equipment to the BUYER's transportation company and PLC shall not be liable for loss, delay or damage to any merchandise after delivery thereof the carrier. It is the responsibility of the BUYER to document any damage immediately upon receipt and request signature from the driver. All claims of shortage or variance in the order must be filed with PLC within 15 days of receipt of shipment and must be accompanied by the packing list from the package. All shortage replacement parts or variance parts will be shipped quickly and invoiced in the usual manner. If, at a later date, the claim is substantiated and approved, proper credit will be allowed.

CANCELLATION

In the event that all or any portion of this order is cancelled by the BUYER without default on the part of PLC, the BUYER shall be liable to PLC for cancellation charges including, but not limited to, PLC's incurred costs plus 20%.

DAMAGES

BUYER's sole and exclusive remedy against PLC for any breach of this warranty or otherwise shall be the repair or replacement of the equipment or parts or at PLC's option refund of the purchase price or other fair allowance. The PLC warranty shall be valid and binding upon PLC if and only if BUYER loads, operates and maintains the equipment in accordance with the instructions provided upon delivery of the equipment. PLC does not guarantee the process of BUYER or the quality of output to be produced by the equipment supplied hereunder and PLC shall not be liable for prospective profits.

It is expressly understood that PLC's liability for products, whether in contract or in tort, is limited to the repair or replacement of the products, or the parts thereof. PLC will not be liable for any other injury, loss, damage or expense, whether direct or consequential, including but not limited to loss of use, income, profit or production, or increased cost of the sale, installation, use of, inability to use, or the repair or replacement of, our products.

Under no circumstances shall PLC be liable for any consequential, special or incidental damages arising from any breach by it.

INSTALLATION AND INTERFACE

It is the responsibility of the BUYER to provide any necessary installation, design, engineering, setup, test and debug of the interface between PLC's and BUYER's equipment. Satisfactory performance of the equipment depends on proper installation, operation and maintenance of the equipment; adequate training of personnel; and use of commodities for which the equipment was designed, all of which shall be the responsibility of the BUYER.



11929 Portland Ave. South Burnsville, MN 55337 Tel: 952-707-9101 Fax: 952-707-1075 www.productlevel.com

Warranty/Customer Support Policy

WARRANTY POLICY. PLC warrants the equipment manufactured by PLC, and not by others, to be free from defects in workmanship and material under normal use and service for a period of one (1) year from date of delivery. Use or service with corrosive or abrasive chemicals or materials is not deemed normal. Components manufactured by others, including expendable items, are warranted only in accordance with the warranty, if any, issued by such other manufacturer. Upon written notice from BUYER specifying the particular defect or defects, PLC will correct without charge any workmanship which is demonstrated to PLC's satisfaction to have been defective at time of installation or erection and will repair or replace without charge, f.o.b. PLC's factory, parts which upon inspection are found defective under normal use within the warranty period above stated. All work of removal and reinstallation or installation of parts, whether or not found defective and shipping charges for defective or replacement parts shall be at the sole expense of BUYER. The foregoing warranty shall not apply to (i) work done or materials furnished by others or (ii) equipment altered by others, unless such repairs or alterations were specifically agreed to in writing by an officer of PLC. All routine maintenance, such as lubrication, adjustments and replacement of expendable items and production consumables and the like are the responsibility of the BUYER. THE WARRANTY HEREIN IS EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES WHATSOEVER, AND SPECIFICALLY THERE ARE NO IMPLIED WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE, PLC SHALL NOT BE SUBJECT TO ANY OTHER OBLIGATIONS OR LIABILITIES WHATSOEVER WITH RESPECT TO EQUIPMENT MANUFACTURED OR SUPPLIED BY, OR SERVICES RENDERED BY, PLC.

Limitations of Warranties

- 1. All invoices are paid consistent with PLC's Terms and Conditions including with no balances past due.
- 2. All parts returned for warranty will be evaluated either by PLC of the Manufacturer and determined if covered under warranty or not covered.

Warranty Claim

- PLC will work quickly to resolve warranty claims. PLC requires notification of any
 equipment or part failure at time of occurrence and failure to do so may disqualify
 the warranty claim.
- On failed components, call PLC for a Return Material Authorization (RMA) number and PLC will immediately send a replacement part or act as a customer representative on any manufacturer warranty. PLC will forward an invoice at time of shipment. The BUYER must return the suspect part using the RMA number and PLC or the component manufacturer will make a final determination if the part is covered under warranty. If the part is covered under warranty, a credit will be issued; otherwise it is the BUYER's responsibility to pay the invoice.
- On system/equipment warranty, PLC will work closely with BUYER and take what
 we feel is appropriate action to bring the system/equipment up to compliance to the
 agreed specifications. No charges will be assessed to the customer for repairs
 needed to bring the system up to the agreed specifications. PLC will charge the
 customer if: 1) changes need to be made beyond what was specified 2) the system
 was incorrectly installed or 3) the equipment was subjected to extraordinary
 conditions.

Customer Support (post Warranty period)

For equipment and systems beyond the warranty period, PLC offers up to 15 minutes free technical support. Beyond 15 minutes, upon BUYER's approval, PLC will charge \$95 per hour or will provide a quotation for the BUYER 's approval. Our sales representative can provide a quotation.

APPLICABLE LAWS

All rights and obligations of the parties hereto shall be governed by and enforced in accordance with the laws of the State of Minnesota including the Minnesota Uniform Commercial Code. Any disputes under this agreement, including breach of performance hereof, shall be litigated and venued in the state or federal courts located in Hennepin County, Minnesota. PLC and BUYER hereby submit to the personal jurisdiction of such courts.



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Start Up/Service

Product Level Control, Inc. (PLC) inspects and tests all equipment before shipping to assure all performance requirements are met. It is the responsibility of the BUYER to make certain the equipment is installed properly and completely. The BUYER can request assistance from Product Level Control, Inc. for start-up services or operation and maintenance at normal service rates. Current Service Rates are listed below.

SERVICE/LABOR RATES

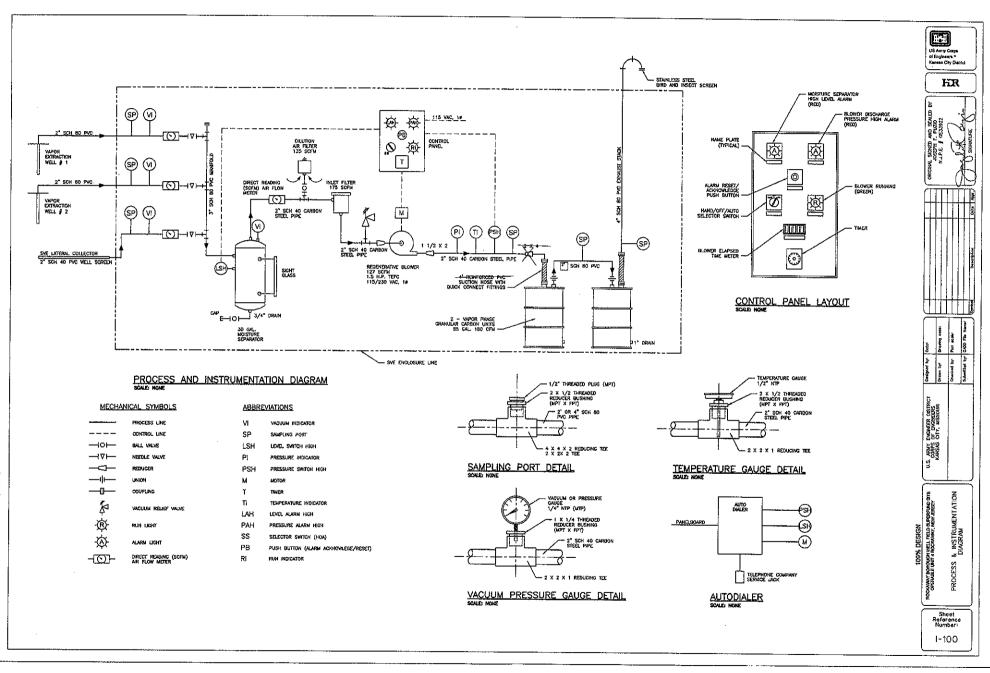
	Service/Travel First 8 hours	Service/Travel Overtime
Monday through Friday	Technician \$85/hr.	Technician \$125/hr
Monday through Friday	Engineer \$100/hr.	Engineer \$150/hr

Product Level Control Inc. serviceman will present a daily log of time worked/traveled for signature by the BUYER'S representative.

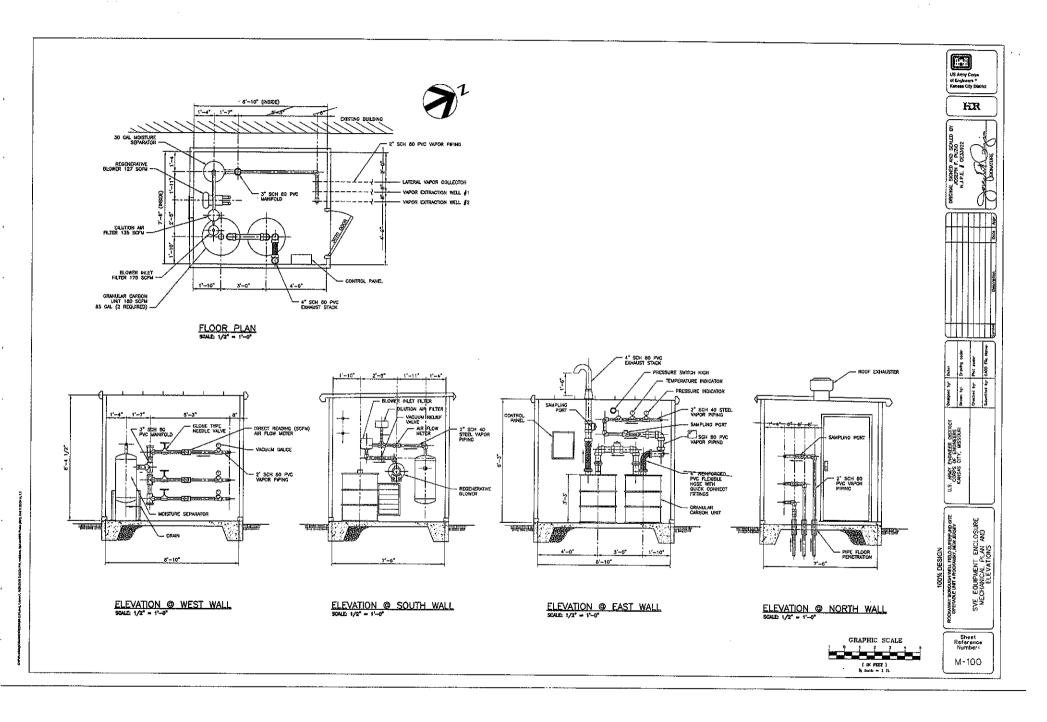
Travel expenses are in addition to the Service/Labor rates.

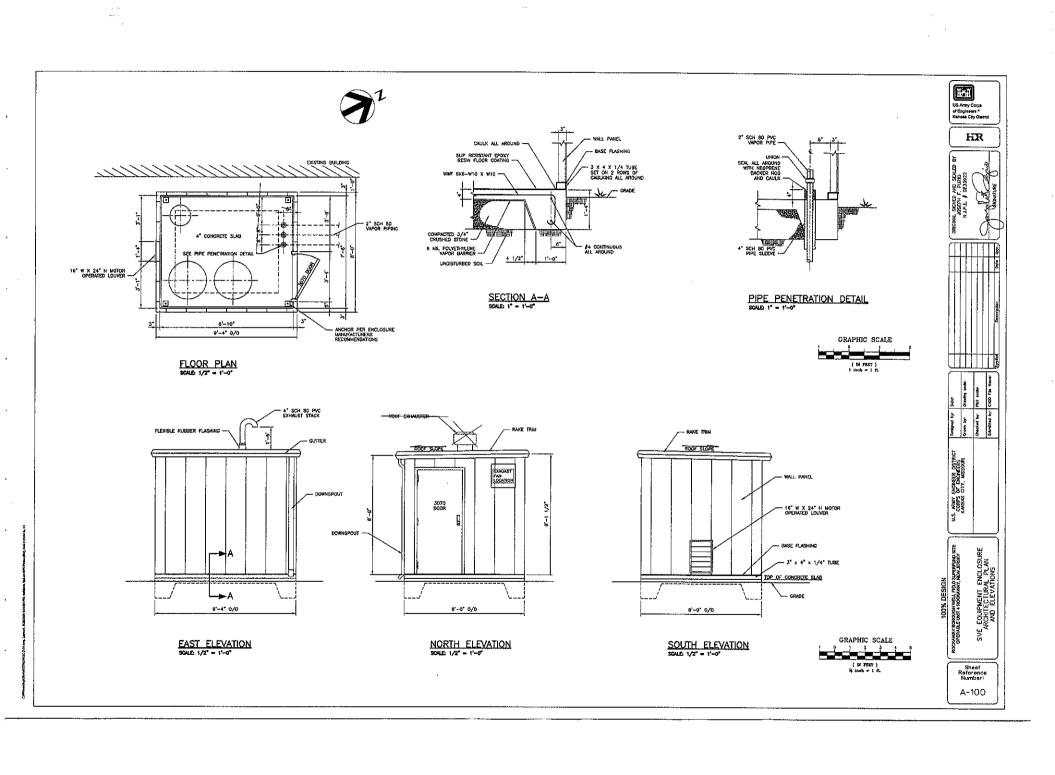
Time is defined as door to door.

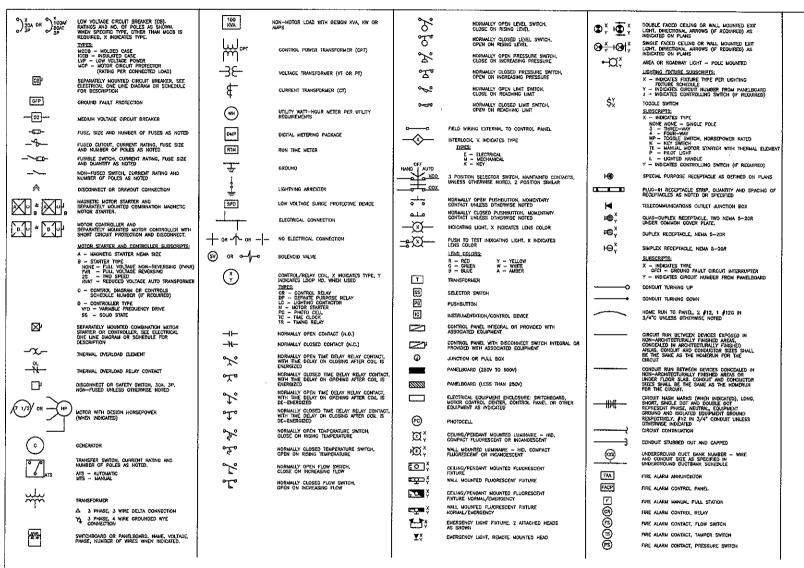
If the BUYER requests serviceman to stay over weekend/holiday to be available on the following workday the BUYER will be billed 8 hours per day at the service rate for each weekend/holiday plus expenses.



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US Army Corps of Engineers * Kenses City Olates

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U.S. ARMY ENGNEER DISTROCT DOORS OF ENGNEERS KANSAS CITY, MSSODIR

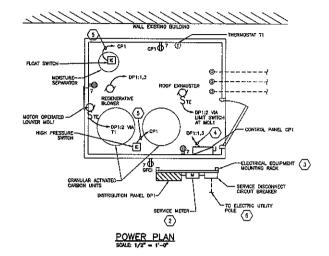
NAVA DESIGN
AWAY SORDION WELL RELD SUFERIAD SI
PEDALLE UNIT A ROCKANAT, NEW JERSEY
ELECTRICAL SYMBOLS

GENERAL NOTES:

- THIS IS A STANDARD ELECTRICAL SYMBOLS SHEET.
 ALL SYMBOLS MAY NOT BE USED ON THIS PROJECT
- SCREENING OR SHADING OF WORK IS USED TO INDICATE EASTING COMPONENTS OR TO DE-EMPHASIZE PROPOSED IMPROVEMENTS TO HIGH SELECTED TRADE WORK, REFER TO CONTEXT OF EACH SHEET FOR USAGE.
- SEE INSTRUMENTATION SYMBOLS SHEET FOR PROJECT SPECIFIC EQUIPMENT SYMBOLS, EQUIPMENT ABBREVIATIONS AND PIPING SYSTEM ABBREVIATIONS.

Sheet Reference Number: E-100





KEY NOTES:

- C1. Onclosed preciouss industrial plugrescent luminum. The 32 mats its lamps, 1207, electronic ballast. Morat luminums at s' -8 agone present ploca. Lithoria da-2-32-120-ceptors or example.
- 2 PROVIDE SENACE METER ENCLOSURE PER ELECTRIC UNLINY'S REQUIRMENTS.
- $\begin{array}{c} 3\\ 3\\ 4\\ \end{array} \text{ see detal. For electrical equaphent accurring rack on sheet die-02.}$
- 5 \$ \$14, 3/4°C.
- 5) SEE DRAWANG E-102 FOR SITE PLAY SHOWING CONTINUATION OF UNDERGROUND CONDUIT TO ELECTRIC UNITY POLE

	WALL EXISTING BUILDING
Account of the control of the contro	1 OP1:4

	PAMELBOARD HQ1	DP1														
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	PHASE:	1		HAIR	OC GEV	CE:				SQ.	/2		HOURT	TNG:	MOUNTING RACK	
	WIRE:	3+GND		INTER	LUPTING	RAT	IN		(KA)	22			LUCAT	TON:	EXTERZOR	
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ĊKī				LOAD		OCI			ocr		COM	YECTEO	LOAD	(VA)	1	icx
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	CONTROL PAVIEL				1,560		2						34:		ROOF EXHAUSTER	73
	Ø1	<u> </u>		L	1,560		Ш	В.	20	1	176				LZGHTS	77
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) EM	AND FACTOR	1.25	MEC	1.00	1.00	20X	۳.			- [2.8	CONNEC	TEO AN		PHASE II (KVA)	\top
SES:	ION LOAD (KYA)	0.2	0.7	0.3	3.1	0.9			5 3	r	33	DESIGN	Lube			

LIGHTING PLAN



H-H

HR

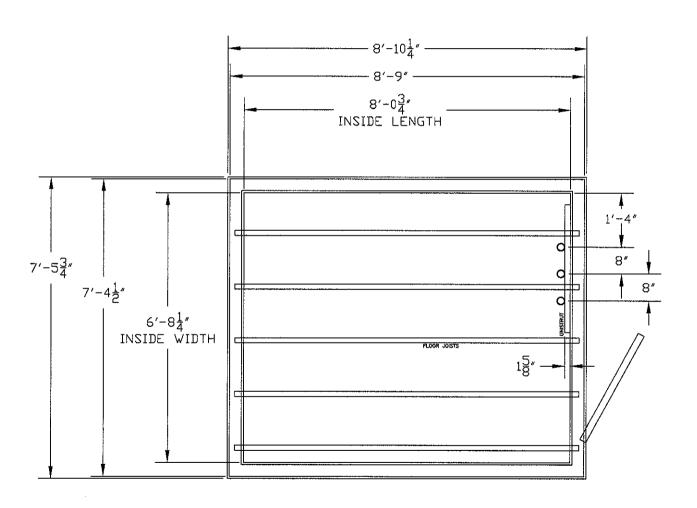
ARMY ENCHEER DISTRICT CORPS OF ENCINEERS KANSAS CITY, MISSOUR

COCKAWAY BOROLKOH WELL FRELD SUPPRENAD STE OPERABLE UNIT 4 ROCKAWAY, NEW JETSEY POWER LIGHTING AND

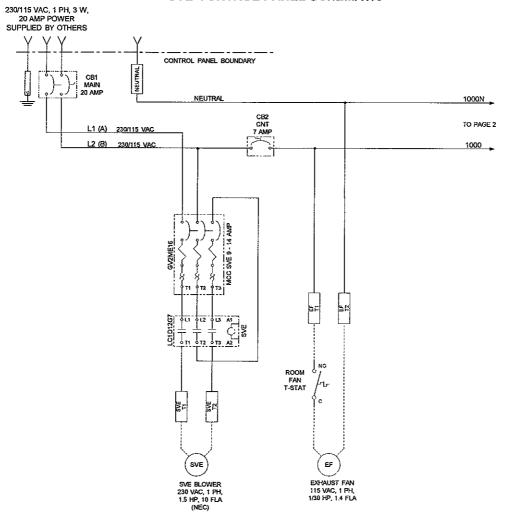
Sheet Reference Number

E-101

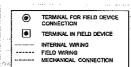
PIPE FLOOR PENETRATION LOCATIONS



SVE CONTROL PANEL SCHEMATIC

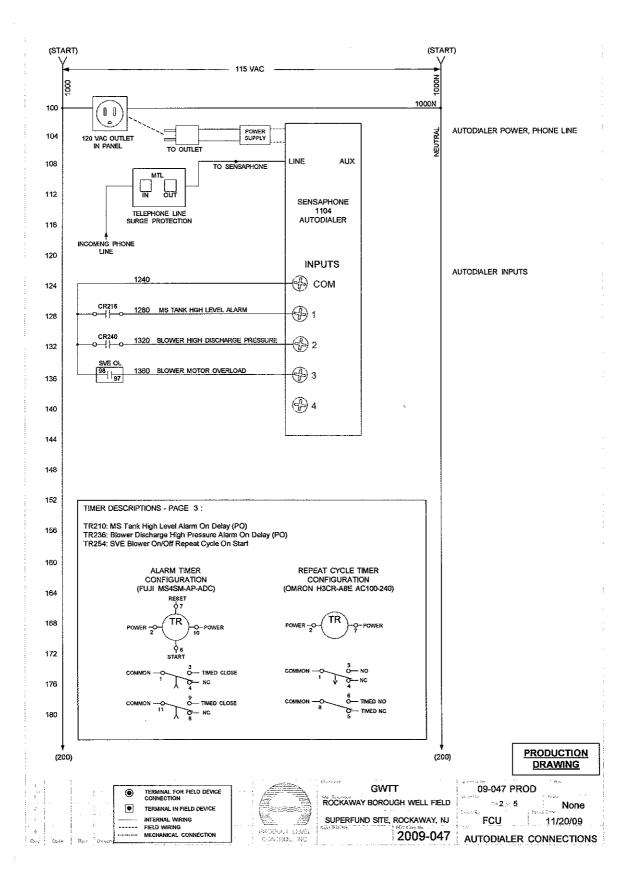


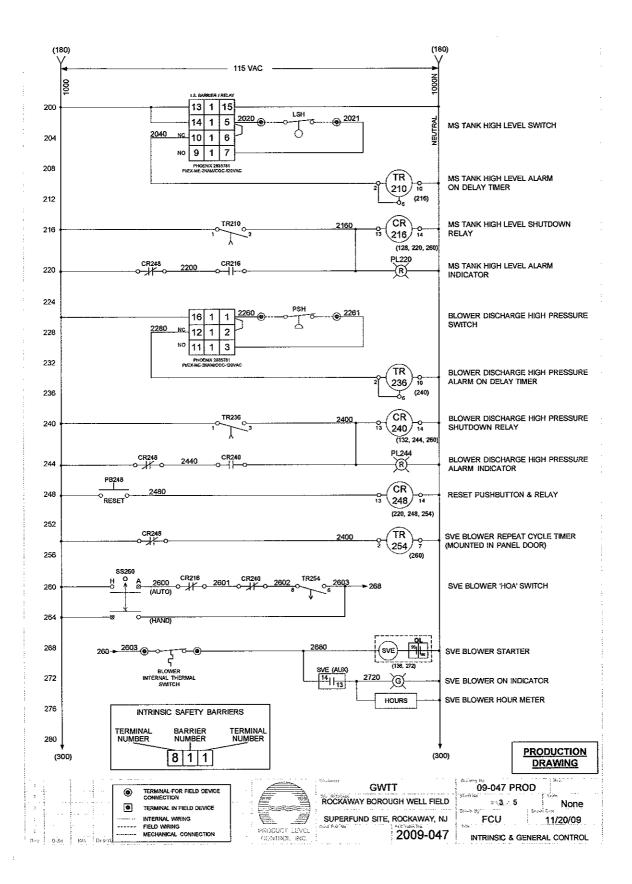






GWTT
ROCKAWAY BOROUGH WELL FIELD
SUPERFUND SITE, ROCKAWAY, NJ
2009-047

90-047 PROD 09-047


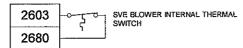


CONNECTION DIAGRAM FOR FIELD DEVICES

INTRINSIC INPUTS

2020	MS TANK HIGH LEVEL SWITCH
2021	
2260	BLOWER DISCHARGE HIGH PRESSURE SWITCH
2261	

NON-INTRINSIC 115 VAC WIRING



PRODUCTION DRAWING





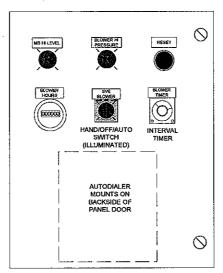
GWTT ROCKAWAY BOROUGH WELL FIELD SUPERFUND SITE, ROCKAWAY, NJ

2009-047

09-047 PROD Solds None
FC11

FCU 11/20/09 FIELD CONNECTIONS

NOTE: CONTROLS SHOWN ON EXTERNAL PANEL DOOR ENCLOSURE MOUNTS INDOORS



NEMA 4, DIMENSIONS: 20"h x 16"w x 10"d

PRODUCTION DRAWING



GWTT
ROCKAWAY BOROUGH WELL FIELD
SUPERFUND SITE, ROCKAWAY, NJ

2009-047

09-047 PROD 0 S 5 None FCU 11/20/09

DOOR LAYOUT DRAWING

SYSTEM STARTUP PROCEDURE

SECTION INCLUDES 1.1 Overview 1.2 Contact person at PLC 1.3 Tools required 1.4 Phone line hookup 1.5 Power hookup 1.6 Overload settings 1.7 External piping hookup 1.8 External switch hookup 1.9 Freezing conditions 1.10 Valve settings 1.11 Turning power on 1.12 Motor rotation 1.13 Heater and exhaust fan 1.14 Switch settings 1.15 Control panel logic 1.16 System operation 1.17 Voltage 1.18 Amperage 1.19 Switch operation 1.20 Conduit seals 1.1 OVERVIEW a) Following is a step-by-step procedure, which will help ensure your system begins its operation successfully. Product Level Control has assembled this startup guide to help ensure common mistakes are prevented and to provide knowledge to our customers. This document cannot be expected to cover all possible startup conditions. Follow all standard safety procedures when following these instructions. c) Startup Location: d) Startup Person: 1.2 CONTACT PERSON AT PRODUCT LEVEL CONTROL a) If at any time you do not understand this procedure, or you would like additional information, do not hesitate to call Product Level Control. When calling, please ask for Bruce at extension 27_ and indicate the phone call is in reference to project 09 - 047____. 1.3TOOLS REQUIRED a) Tools listed below are in addition to a typical tool set. i) Voltmeter ii) Clamp on amperage meter iii) Telephone

iv) Flashlight

1.4 PHONE LINE HOOKUP

- a) If your system includes an auto dialer, telephone service is required. Typically, the local telephone company or your contractor will run the phone line to the control panel on the system. If your system does not require telephone service, please proceed to the next section.
 - i) Verify the phone service is operating properly by connecting a telephone to the incoming phone line and making a phone call. Note that some customers put long distance blocks on the telephone service.
 - ii) Connect the phone line to the control panel. Labels inside the control panel will guide you to this connection.
 - iii) Auto dialers require setup. Please refer to the auto dialer's operation and maintenance manual for setup instructions. Confirm that there are batteries in the auto dialer. Product Level Control will gladly assist you in this setup if requested.

1.5 POWER HOOKUP

- a) Typically a licensed electrician runs wiring from the power source to the system. Depending on local codes, a disconnect separate from the control panel disconnect may be required.
- b) Disconnect switch inside of system's control panel is to remain off. Do not turn disconnect on until supplied voltage is verified as described below.
- c) If present, open the white swing out panel inside of the control panel. Use caution when this door is open because high voltage wires are present.
 - (a) Inside of the system's control panel, verify supplied power agrees with the system's electrical prints and labels inside of the panel. If a neutral termination is present in the control panel, be sure the neutral wire has been run from the power source to this termination.
- d) On single-phase systems, be sure all required incoming power connections are made in control panel's termination block.

volts, call Product Level Control.

i) Record voltage reading across all phases
(1) A – B phase voltage = _______(if B phase present)
(a) Above voltages should be within 10% of requirement.
(b) If (a) is not true, call Product Level Control
(2) A – neutral phase voltage = ______(if B phase present)
(a) If above voltages in (2) and (3) are not between 110 and 125

1.6 OVERLOAD SETTINGS

- a) Normally every motor has an overload relay located inside the control panel. Overloads are designed to trip when a motor draws more amps than the motor is designed for.
- b) Verify each overload setting matches each motor's full load amperage as indicated on the motor's nameplate. Note that most motors are rated for more than one voltage so be sure you are reading amperage on the motor

- nameplate as it relates to the supplied voltage. Now is a good time to record the motor nameplate amperages in Section 1.19 chart.
- c) Product Level Control set these overloads correctly during in house testing. The above steps verify settings have not changed during shipment.

1.7 EXTERNAL PIPING HOOKUP

a) You soon will be running the system. Now is a good time to make sure all inlet and outlet piping assemblies are connected to the system properly and also make sure all valves external to the system are set properly.

1.8 EXTERNAL SWITCH HOOKUP

a) Make sure all switches external to the system are connected properly. These may include injection gallery level switches or down well pump control switches.

1.9 FREEZING CONDITIONS

- a) Freezing conditions or conditions where freezing has occurred recently can cause problems. Ice in pipes will restrict flow and may cause extreme pressure or vacuum levels that can cause equipment failure.
- b) Verify assemblies in the system do not have ice present.
- c) Verify piping outside of the system does not have ice present. Ice blockages in exterior piping can cause catastrophic equipment failures.

1.10 VALVE SETTINGS

- a) For systems that include sparge compressors:
 - i) Open all valves in system except for sample ports. Valves to open include: all ball valves and gate valves including the bleed air valve.
- b) For systems that include soil vapor extraction pumps or blowers:
 - Open all valves in system except for sample ports and relief valves.
 Valves to open include: all ball valves and gate valves including the bleed air dilution valve.
 - ii) Do not open manual tank drain valves.
 - iii) If your system has a vapor carbon bypass, arrange valving according to your preference.
 - iv) If your system includes water transfer pumps, open each pump's downstream gate valve 1 full turn from closed. This will allow for a restricted flow, which can be adjusted later according to site conditions. Also, make sure all drain plugs are installed.
- c) For systems that include air strippers:
 - Open all valves in system except for sample ports. Valves to open include: all ball valves, gate valves and the air damper on the air stripper blower.
 - ii) Adjust the influent water transfer pump's downstream gate valve 1 full turn from closed. This will allow for a restricted flow, which can be adjusted later according to site conditions. It is common for an air stripper to not perform according to specifications due to an influent water flow higher than specified.
 - iii) Verify all drain plugs are installed. Inspect lower stage of air stripper for a small drain hole.

iv) Adjust effluent water valving to a capacity slightly higher than the influent.

1.11 TURNING POWER ON

- a) Position all Hand-Off-Auto (HOA) selector switches to Off position. See HOA descriptions below
 - i) Hand, H: motors will run, all operating and safety switches are ignored.
 - ii) Off, O: motors will not run, all operating switches are ignored.
 - iii) Auto, A: motors will run according to operating switches and system logic.
- b) Power up the control panel by switching the disconnect in the panel to the on position.

1.12 MOTOR ROTATION

- a) Correct motor rotation is extremely important.
- b) Your system was completely wet tested at Product Level Control. When it was tested, all motors were rotating the correct direction. On site, power phasing or wiring may cause the motors to rotate the wrong direction.
- c) Read and understand all operating instructions for each piece of equipment. Follow the manufacturer-supplied instructions to verify all pieces of equipment are ready for operation.
 - i) If you system includes an Emergency Stop button (E Stop), make sure this red knob is pulled out. System will not operate if Emergency Stop is pushed in.
- d) For single phase power systems:
 - Select a single-phase motor for which you would like to check rotation. Make sure this motor will not cause damage to the system or itself if it rotates backwards.
 - ii) Turn HOA switch to hand momentarily (less than 1 second) to check rotation. This step usually works with more success if there is another person watching the motor as it starts up. Remember to follow proper safety procedures.
 - iii) If motor rotation is not correct, the wiring at the motor's junction box is not correct. Turn off power at the source, remove motor's junction box cover, inspect wiring diagram at junction box to determine how to reverse rotation. Follow all typical safety procedures when performing this step including locking power off at the source. Record the new voltage values in above Section 1.6. All motors should now be set to rotate in the correct direction.
- e) Verify all motors are rotating in the correct direction by momentarily turning each HOA switch to Hand and watching their rotation.

1.13 HEATER AND EXHAUST FAN

- a) Verify each exhaust fan starts when the exhaust fan thermostat is set at a temperature below ambient. Make sure exhaust fan stops when the thermostat is set at a temperature above ambient.
- b) Verify each heater starts up when the heater thermostat is set at a temperature above ambient. Make sure heater shuts down when the thermostat is set at a temperature below ambient.

1.14 SWITCH SETTINGS

- a) Locate all system switches in system. Typically, these can be pressure, vacuum, level or temperature switches.
- b) Set these switches in positions that you believe to be correct based on anticipated run conditions. These settings can be changed later.
- c) Some level switches include legends at the switch to indicate proper position. Verify these switches are installed according to the legend.

1.15 CONTROL PANEL LOGIC

- a) The control panel tells the system how to operate. It is important to understand the logic.
- b) Read the attached Alarm Interlock Schedule and Sequence of Operations.
- c) It is common for operators to believe the system is malfunctioning while in fact it is operating as designed.

1.16 SYSTEM OPERATION

- a) The system is now ready to be operated.
- b) Water transfer pumps will be damaged if ran dry. Before operating transfer pumps, make sure they are primed properly.
- c) Start system by placing all HOA selector switches in Auto and then press and release the Reset button.
- d) System should now be operating.
- e) Inspect system as it operates and listen for abnormal noises or vibrations.
- f) Adjust bleed air dilution valves on sparge and SVE systems to bring pressure levels to desired operating conditions.

1.17 VOLTAGE

a) With a majority of the motors operating including the largest motor, record voltage readings across all phases and document in the chart below. Fluctuating or decreased voltages cause system performance issues and damage to motors.

Date/Time	L1-L2	L1-L3	L2-L3	L1-neutral	L2-neutral	L3-neutral
						
				<u> </u>		

1.18 AMPERAGE

- a) While motors are operating, record amperage values from each motor.
 - i) Typically, amperage readings are taken inside of control panel.
 - ii) Take amperage readings from each leg of each motor and record in chart below.
 - iii) Compare amperage readings to motor nameplates.

Motor	nameplate amps	L1 amps	L2 amps	L3 amps	neutral amps
				<u> </u>	
					-

1.19 SWITCH OPERATION

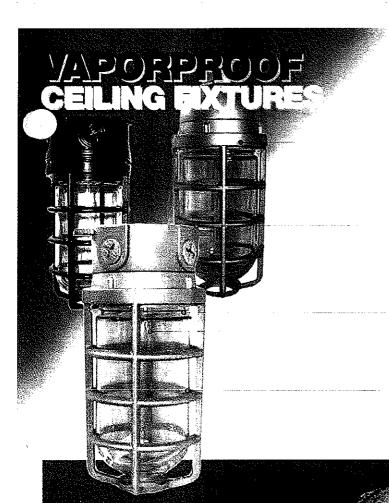
- a) While system is operating, manually adjust each switch one at a time to cause fault conditions. These switches include pressure, vacuum, temperature and level.
- b) Verify system responds properly according to the system's logic.

BUILDING PARTS LIST



File Name: Customer: Site Reference: Date: Generated by: Parts List
GWTT
ROCKAWAY NJ
11/24/2009
BGG

Reference	Qty	Units	Description	Material	Part Number
BUILDING	1	each	ENCLOSURE, EXTERIOR DIMENSIONS: 7' - 5" W X 8' - 9" L X 8'		
			8" H, 2 X 4 X 16" O.C. CONSTRUCTION, SINGLE PITCH STEEL		
			ROOF, ROUGH SAWN T1-11 SIDING, SOLID OIL STAINED		
			SEACOAST GRAY EXTERIOR, R-11 INSULATED, 5/8" FIRE		
			RATED SHEETROCK TAPED ONCE INTERIOR, WOOD FLOOR		
LIGHT	2	each	VAPORPROOF CEILING MOUNT LIGHT WITH 4"	AL	RAB-VX100DG-3/4" WITH 26
			WEATHERPROOF BOX, QTY 4 OF 3/4" NPT CONDUIT		WATT CFLB
			FITTINGS, MOUNTING LUGS, GLOBE AND GUARD, 150 WATT		
			MAX BULB WITH CLEAR GLOBE, FOR NON CLASSIFIED		
			LOCATIONS		
LIGHT	2	each	Spiral Screw-in Compact Fluorescent Bulb 27 Watt=100 Watt		1949K26
			Incandescent, 4100K, 15000 Hrs		
EXHAUST FAN	1	each	LINE VOLTAGE COOLING-ONLY SNAP ACTION THERMOSTAT,		Columbus Electric-1A22-7
			90 TO +130°F, SPST CLOSES ON TEMPERATURE RISE, NEMA		
			1, CONTROLS UP TO A 3/4 HP MOTOR @ 125 VAC, 1-1/2 HP @		
			250 VAC		
EXHAUST FAN	1	each			GRAINGER 1HLA2
			Propeller Dia 12 In, CFM @ 0.000-In SP 800, @ 0.125-In SP 470,		
			Sones @ 0.000-In. SP @ 5 Ft. 7.6, Voltage 115, 60 Hz, Single		
			Phase, Full Load Amps 1.4, HP 1/30, Max Ambient Temp 104 F,		
			Motor Type Shaded Pole, Bearing Type Sleeve, Height 15 1/8 In,		
			Width 15 1/8 In, Max Depth 12 1/8 In, Sq Opening Required 13 In,		
			Propeller Material Stamped Aluminum, Guard Material Steel,		
			Includes Automatic Shutter MOUNTED TO SIDE WALL NEXT TO		
			DOOR		



Durable, versatile and economical. Use RAB vaporproof incandescent or fluorescent lighting for non-hazardous locations

Die cast aluminum for superior durability Set screw keeps guard securely in place

All brass hardware

Close-up plugs allow Phillips or slotted screwdrivers for easy installation

Junction box with sturdy mounting lugs

One piece die cast aluminum quards threaded for secure fit

UL Listed for use with 90°C supply wiring OK for use in dwellings and wet locations

High temperature silicone internal gaskets Premium porcelain socket with 150°C 8" long leads

Adapter plate included with VC fixtures

Clear heat resistant glass globes standard Polycarbonate Permaglobes available

Packed partially assembled for fast installation













Natural Fixture with:

clear glass & die cast guard

clear glass & wire clamp gua

clear glass globe

clear Permaglobe

white Permaglobe

Fixture less globe 13 watt Fluorescent, 120 Volt

22 watt Fluorescent. 120 Volt Lamp included

3/4" tapped hubs

Finish- Add suffix:

Silver Gray White

Black

Special Globes

Colored globes (White, Red, Blue, Green or Amber) in cylindrical or ball shapes are available in glass or polycarbonate. Order a vaporproof fixture less globe and combine it with a Globe from page 136.











Specifications @.

UL Listing:

Suitable for wet locations. Suitable for use in dwellings Suitable for use with 90°C supply winner Complies with UI Standard 1598 For non-hazardous locations where the lamp. rain, corrosive fumes, non-combustible

socket and wiring require protection from dusts, moisture, non-explosive vapors and gases. For lamp base up installation only when outdoors.

Wattage:

See catalog number chart for maximum wattage with clear glass, colored glass 1 Permaglobes.

....b Size:

1/2" or 3/4" NPS. Metric size hub taps available. Consult factory.



Globes:

Clear thermal shock resistant soda lime glass standard. Colored and white glass globes available. Unbreakable RAB Permaglobes available in clear and in color. See page 136.

Reflectors: Highly reflective white baked polyester epoxy powder finish over a heavy gauge aluminum base. Reflectors thread onto fixtures. See page 138.

Finish:

Natural unpainted finish standard, Painted finishes of Silver Gray (add suffix S), White (add W) and Black (add B). Other finish colors available. Consult factory.

Construction:

Die cast aluminum with brass screws Guard: One piece die cast aluminum with set screw

Wire Guard:

8 gauge steel wire with silver powder coat

Socket:

Incandescent: Premium porcelain with 150°C 8" leads attached. Fastened with 2 brass screws.

CFL: 13w = GX23-2 Base 22w = GX32d-2 Base

Fax Info on Demand 24/7 Call RAB FaxBack at 888 722-1236. Enter document numbers shown below:

Catalog Page Installation Manual VX, VP, VC

& VLX For more info on RAB FaxBack see p.170

Cross References:

Available on pages 162 and at www.rabweb.com

VX 4" Box

Box mount, die cast aluminum with built-in junction box and sturdy mounting lugs. Medium base sccket, 1/2" or 3/4" NPS hub size and a variety of globes. Incandescent up to 300 watts (lamp not supplied).

CFL: 13 or 22 watts (lamp included).

○ Natural Finish: Silver Gray OWhite

Black



VP Pendant

Pendant mount, die cast aluminum construction. Medium base socket, 1/2" or 3/4" NPS pendant thread and a variety of globes. Incandescent up to 200 watts (lamp not supplied). CFL: 13 or 22 watts (lamp included).

Black

 Natural Finish: Silver Gray White



VP100DG shown in natural

VC Ceiling

Die cast aluminum construction. Mounts to existing surface or recessed 4" boxes. Adapter plate provided. Medium base socket and a variety of globes. Incandescent up to 150 watts (lamp not supplied).

CFL: 13 or 22 watts (lamp included).

○ Natural Finish:

Silver Gray

White

Black

VLX 3" Box

Die cast aluminum with built-in 3" junction box and sturdy mounting lugs. Medium base socket, 1/2" or 3/4" NPS hub size and a variety of globes, incandescent up to 150 watts (lamp not supplied). CFL: 13 or 22 watts (lamp included).

Finish: O Natural



VC100DG shown in natural



VLX100DG shown in natural

Catalon Numbers

valainy ivui	HBG12
100 Series	200 Series
Max Watts	Max Watts
150w Clear Glass	300w Clear Glass
100w Colored Glass	200w Colored Glass
75w Permaglobe	100w Permaglobe
VX100DG	VX200DG
VX100G	VX200G
VX100	VX200
VX100P	VX200P
VX100PW	VX200PW
VX1	VX2
add /F13	
	add /F22
ade -3/4	add -3/4
add S	add S
add W	add W
add ${f B}$	add B

For Natural & 1/2" taps, no suffix needed.

100 Series Max Watts 50w Clear Glass 00w Colored Glass	200 Series Max Watts 200w Clear Glass 150w Colored Glass
75w Permaglobe /P100DG	100w Permaglobe VP200DG
/P100G	VP200G
/P100	VP200

VP100P	VP200P
VP100PW	VP200PW
VP1	VP2
add /F13	
	add /F22
add -3/4	add -3/4

add W add W add B add B For Natural & 1/2" taps, no suffix needed.

add S

100 Series Max Watts 100w Clear Glass 100w Colored Glass 75w Permaglobe	200 Series Max Watts 150w Clear Glass 100w Colored Glass 100w Permaglobe
VC100DG	VC200DG
VC100G	VC200G
VC100	VC200
VC100P	VC200P
VC100PW	VC200PW
VC1	VC2
add /F13	
	add /F22

add -3/4 and -3/4 add S add S add W add W add B artor B

For Natural, no suffix needed.

100 Series

Max Watts 150w Clear Glass 100w Colored Glass 75w Permaglobe

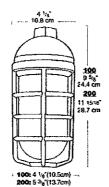
VLX100DG

Dimensions

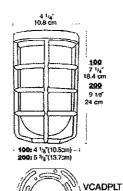


VP100DG & VP200DG

add S



VC100DG & VC200DG



Adapter plate (VC fixtures only)

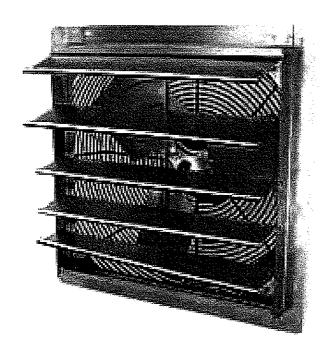
VLX100DG & VLX200DG



Exhaust Fan,12 In,115 V,800 CFM HVACR

- > Exhaust Fans
- > Shutter Mount Exhaust Fans

Exhaust Fan, Direct Drive, Shutter Mounted, Speed Controllable, Propeller Dia 12 In, CFM @ 0.000-In SP 800, @ 0.125-In SP 470, Sones @ 0.000-In. SP @ 5 Ft. 7.6, Voltage 115, 60 Hz, Single Phase, Full Load Amps 1.4, HP 1/30, Max Ambient Temp 104 F, Motor Type Shaded Pole, Bearing Type Sleeve, Height 15 1/8 In, Width 15 1/8 In, Max Depth 12 1/8 In, Sq Opening Required 13 In, Propeller Material Stamped Aluminum, Guard Material Steel, Includes Automatic Shutter



Item	Exhaust Fan
Туре	Direct Drive, Shutter Mounted, Speed Controllable
Propeller Dia. (In.)	12
CFM @ 0.000-In. SP	800
CFM @ 0.125-In. SP	470
Sones @ 0.000-In. SP @ 5 Ft.	7.6

Motor RPM 1550

Voltage 115

Hz 60

Phase 1

Full Load Amps 1.4

HP 1/25

Max. Ambient Temp. (F) 104

Motor Type Shaded Pole

Motor Enclosure Totally Enclosed Air-Over

Motor Insulation Class A

Bearing Type Sleeve

Height (In.) 15 1/8

Width (In.) 15 1/8

Max. Depth (In.) 12 1/8

Sq. Opening Required (In.) 13

Frame Material Cold Rolled Steel

Frame Finish White Polyester

Propeller Material Stamped Aluminum

Guard Material Steel

Wire Guard Finish Gray Polyester

Speed Control 1DGV1

Number of Blades 3

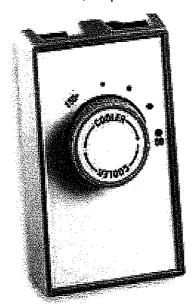
Agency Compliance UL Listed for US and Canada

Includes Automatic Shutter

COLUMBUS ELECTRIC 1A22-7 Thermostat, Attic Fan **HVACR**

- > HVACR Controls
- > Line Voltage Thermostats
- > Thermostat, Attic Fan

Attic Fan Thermostat, Voltage Rating 115/230 Volts, Switch Action Close on Rise, Switch SPST, Temperature Differential 15 Degrees Fahrenheit, Temperature Range 80 to 130 Degrees Fahrenheit, Height 4 9/16 Inches, Width 2 13/16 Inches, Depth 2 1/8 Inches



COLUMBUS ELECTRIC 1A22-7 Thermostat, Attic Fan

Item	Line Voltage Thermostat
Туре	Cooling Only
Switch Type	SPST
Switch Action	Close on Rise
Number of Switches	1
Control Range (F)	80 to 130
Differential (Deg. F)	15

Height (In.) 4 9/16 Width (In.) 2 13/16 Depth (In.) 2 1/8

Sensor Type

Bimetal

Characteristics

Commonly Used as a Ventilation Control

For Use With

Attic Ventilators, Fans and Dampers

Color

Beige/Silver Face

Application

Cooling Only

Display

Analog

Voltage Range

120 to 240 VAC

Inductive Amps @ 120V

13.8

Inductive Amps @ 240V

10

Full Load Amps @ 120V

13.8

Full Load Amps @ 240VAC

10

Locked Rotor Amps @ 120V

82.8

Locked Rotor Amps @ 240V

60

Mounting

Standard 2 x 4" Vertical Box

SVE PARTS LIST



File Name: Customer:

ROCKAWAY NJ 11/24/2009 BGG

Parts List

GWIT

Site Reference: Date: Generated by:

Reference	Qty	Units	Description	Material	Part Number
BLOWER	1	each	HRB301 Republic Regenerative Blower Includes: Direct drive, Sound		HRB301 Republic
			Level 75db, 2 Horsepower motor 110/230/1/60, TEFC		Regenerative Blower
INLINE FILTER	1	each	FILTER, AIR, INLINE, 2" FNPT WITH QUICK RELEASE LID-175	STEEL/POLY	SOLBERG-CSL-851-200HC
			CFM	ESTER	
DILUTION VALVE	1	each	VALVE, BALL, FNPT, 2" FULL PORT, 600 NSWOG 150 WSP, 0-	BRASS/TFE	MATCO-750T08
			400°F		
DILUTION VALVE	1	each	FILTER, AIR, INLET SILENCER, DILUTION FILTER SILENCER, 2"	STEEL/POLY	SOLBERG-FS-31P-200
SILENCER			MNPT-135SCFM	ESTER	
VRV	1	each	VACUUM RELIEF VALVE, 2" FNPT, 2/229, 5/338, 10/415, 15/426,	BRONZE, SS,	KUNKLE-215V-H01AQE0004
			20/426 ("HG/SCFM RATING) RATED FOR SERVICE UP TO	CAST	(SET VACUUM, 4 INCH Hg)
			29"HG		
PI	1	each	GAUGE, PRESSURE, 0-60" WC 2 1/2" DIAL 1/4" MNPT CBM -20-	PS/CU,BR,PS,	Ashcroft-
			180°F	RTV	251490A02BXXX60"H2O
ΤI	1	each	THERMOMETER, 0-250°F 3" DIAL 2 1/2" STEM 1/2" MNPT CBM	300 SS	GOODIN-3BM25250, WEISS
					3BM25
PRESSURE SWITCH	1	each	DWYER DIFFERENTIAL SWITCH MODEL 1950		1950P-2-2F
AIR FLOW METER,	1	each	VENTURI FLOWMETER, 2" FPT, 45-225 SCFM ROTRON	ALUMINUM	ROTRON-FM20C225Q-
MAIN					550604
AIR FLOW METER,	3	each	VENTURI FLOWMETER, 2" FPT, 13-65 SCFM ROTRON	ALUMINUM	ROTRON-FM20C065Q-
MANIFOLD					550601
VI	3	each	GAUGE, VACUUM, 0-100" WC 2 1/2" DIAL 1/4" MNPT LBM -20-	PS/CU,BR,PS,	Ashcroft-
			180°F	RTV	251490A02LXXX100"H2OVA0

Ring Blower • Side Channel Blower • Regenerative Blower Owner's Manual



Republic Blower Systems

Www.republicsales.com

Regiser 108

2-708 repure Suppressum



Use Criteria

- ▲ Use only clean, dry air.
- ▲ Do not use flammable or explosive gases or atmosphere that contains such gases.
- ▲ Operate at 0°C 40°C (32°F 104°F).
- ▲ Protect unit from contaminants and moisture.
- ▲ Protect all surrounding items from exhausted air. This exhausted air can be very hot.
- ▲ Air particles, water vapor, oil based contaminants or other liquids must be filtered out.
- ▲ This blower must be installed with the proper sized inlet and inline filter, gauge and relief valve to protect the blower from contaminants and over-heating.
- ▲ When using the blower at a high altitude or high temperatures, please consult with Republic Blower Systems prior to use.

Safety Notice

To insure safe operation, we have provided many important safety guidelines in this manual for the Republic Regenerative Blower. Please read this instruction manual carefully and pay particular attention to instructions with the following signs:



DANGER: Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



WARNING: Indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury.





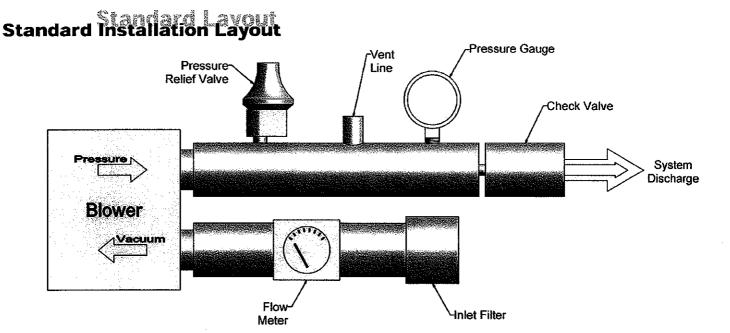


Electrical Shock Hazard

- ▲ Disconnect electrical power at the circuit breaker or fuse box before installing this product.
- ▲ Install the blower in a location where it will not come into contact with water or other liquids.
- ▲ Install the blower in a location protected from the weather.
- ▲ Electrically ground the blower.
- ▲ Failure to follow these instructions can result in death, fire or electrical shock.

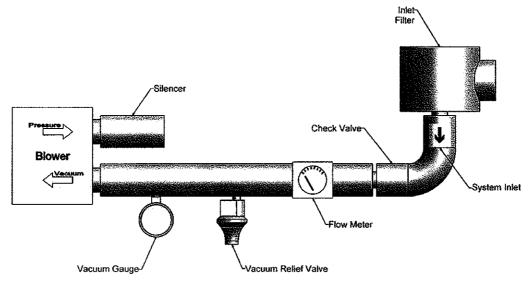
Notice of Installation

- ▲ Correct installation is your responsibility.
- ▲ Make sure you have the proper installation conditions and that installation clearances do not block air flow.
- ▲ Blocking air flow over the blower in any way can cause the product to overheat.
- ▲ The blower must be installed with the proper sized inlet filter, gauge and relief valve to protect the product from contaminants and over-heating.





Typical Vacuum Arrangement



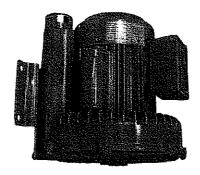
- 1. Recommended piping should be, at minimum, the same size as the inlet and outlet ports.
- 2. Metal piping is recommended for the first five (5') to eight (8') feet from the blower on pressure systems.
- 3. Elbows increase friction. Minimizing the amount of elbows in the piping run will decrease friction loss.
- 4. Pressure or relief valves should be installed in a "T" that is at least one (1) pipe size larger than the port diameter.
- 5. Exhaust air temperature increases significantly above 65" of water column. Discharged air is typically too hot for most plastic piping. Therefore, metal piping is recommended for at least the first five (5') to eight (8') feet from the blower on the discharge side. In addition, this piping MUST be guarded and marked "DANGER-HOT-DO NOT TOUCH."

1-1. Installation

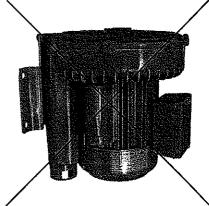
Install the blower on a level, stable operating surface and use the isolation pads provided to reduce noise and vibration.



Horizontal Position



Vertical Position



Position Unapproved



1-2. Rotation

From the motor side of the blower, verify the blower is rotating in the direction indicated by the arrow on the motor. (The motor side is marked with an arrow on most models.) Proper rotation can also be checked by the air flow at the inlet and outlet ports. On blowers powered by a 3-phase motor, change the connection of any two (2) wires to reverse blower rotation.

1-3. Plumbing

Remove any foreign material (burrs, chips, welding drops, slag, pipe cuttings, excess sealant, sand or lime) from plumbing.

Verify the motor is securely mounted and proper blower rotation before connecting to plumbing. The inlet and outlet port are not designed to support the plumbing without proper supporting elements. Remove safety rubber plugs from the inlet and outlet ports. Connect the plumbing with properly sized fittings.

Use a relief valve to discharge excess air beyond the preset level on pressure applications. Use a vacuum relief valve to draw in excess air when preset vacuum level is achieved.

Install an intake filter to prevent foreign material from entering the blower. In applications where there is high humidity or liquids being used in the process, install a moisture separator with a drain valve.

1-4. Accessories

Install two gauges (vacuum or pressure), one before and one after the filter, to monitor differential through the filter element. As filters become clogged, performance efficiency will be reduced. Filters should be checked periodically and replaced when necessary. The recommended check valves provide minimal pressure drop, positive sealing, and are resistant to the high discharge temperatures of the blowers. (Refer to Republic Regenerative Blower Check Valves List)

1-5. Motor Control

It is your responsibility to contact a qualified electrician and assure that the electrical installation is adequate and in compliance with all national and local electrical codes.

Select fuses, motor protective switches, or thermal protective switches to provide protection. Fuses act as short circuit protection for the motor, not as protection against overload. Incoming line fuses must be able to withstand the motor's starting current. Motor starters with thermal magnetic overload or circuit breakers protect motor from overload or reduced voltage conditions. Motors without automatic restart require thermal protection or magnetic over-current cutout to prevent motor overloading from single phasing in a 3-phase circuit, high starting frequency, or locked blower.



1-6. Electrical Connection



Electrical Shock Hazard

- ▲ This product must be properly grounded.
- ▲ Do not modify the plug provided. If it will not fit the outlet, have the proper outlet installed by a qualified electrician.
- ▲ If repairing the cord or plug, do not connect the ground wire (green or green with yellow stripes) to either terminal.
- ▲ Check the condition of the power supply wires.

1,200,201 1,400,401,402,4	IRB100,101 1,202,202/1 402S,500,50	300 301 302	302/		ection 0,902,1000,10 1300,1302,	02,1100,1102,1200 1402,1502	0,1202,	
6 cak	ole	Υ90	cable	Δ9	cable	You do not have been seen as a second of the	12 cable	High Voltage
Low Voltage H 220-220	ligh Voltage 380-440	Low Voltage 220	High Voltage 440	Low Voltage 220	High Voltage 440	Low Voltage 220	Middle Voltage 380	L ₁ L ₂ L ₃
1 1 1 1	L ₁ L ₂ L ₃ 	L ₁ L ₂ L ₃ I I I 1 2 3 I I I 7 8 9 4-5-6	L ₁ L ₂ L ₃ 1 1 1 1 2 3 4 5 6 1 1 1 7 8 9	L ₁ L ₂ L ₃ l	L ₁ L ₂ L ₃ 1	L ₁ L ₂ L ₃	L ₁ L ₂ L ₃ 1	1 2 3 1 1 1 12 10 11 4 5 6 1 1 1 7 8 9

Connection				
Low Vol	tage (2Y)	High Voltage (Y)		
11	ÓV	230V		
R	5	R S		
1	ŀ	1 1		
7	2	4 1		
1	1	+ +		
. 3	4	5		
1	}	1		
6	5	2 - 3 - 6		
Reverse:	R-1-3-5	Reverse: R-4		
5-2-4-6		5-1-5		
(2-3-6)				
Connect hot lead to 1. Connect neutral lead to 4.				



- FPUBLIC · lower Systems'
 - ▲ Do not permanently connect this product to wiring not in good condition or that is inadequately sized for the requirements of this blower.
 - ▲ Failure to follow these instructions can result in death, fire or electrical shock.
 - ▲ This product must be grounded. In the event of an electrical short circuit, grounding reduces the risk of electric shock by providing an escape wire for the electric current.
 - ▲ Check with a qualified electrician or serviceman if the grounding instructions are not completely understood, or if you are not sure whether the product is properly grounded.

WARNING

Injury Hazard

- ▲ Install proper safety guards as needed to prevent any close contact with blower suction area.
- ▲ Keep fingers and objects away from openings and rotating parts.
- ▲ Blower surfaces become very hot during operation. Allow these surfaces to cool before handling.
- ▲ Wear proper eye protection. Air stream from product may contain solid or liquid material that can result in eye or skin damage.
- ▲ Wear hearing protection. Sound level from some models may exceed 85 dBA.
- ▲ Failure to follow these instructions can result in burns, eye injury or other serious injury.
- ▲ It is your responsibility to operate this product at recommended pressures or vacuum duties and room ambient temperatures. Do not throttle discharge or suction pipe to reducer capacity. Throttle will increase differential pressure causing increasing power absorption and working temperatures.

Start Up

Operate blower for an hour and then check:

- 1. Ambient temperature Increased room temperatures may require stronger ventilation especially for larger blowers. Room temperature should not exceed 100°F.
- 2. Pressure and vacuum valves Adjust relief valve pressure or vacuum setting, if needed.
- 3. Motor current Check that supply current matches recommended current rating on blower nameplate.
- 4. Electrical overload cutout Check that current matches rating on blower nameplate.

If motor fails to start or slows down significantly under load, shut off and disconnect from power supply. Check that the voltage is correct for the motor and that the motor is turning in the proper direction.



3. Maintenance



Electrical Shock Hazard

- ▲ Disconnect electrical power supply cord before performing maintenance on the blower.
- ▲ If product is hard wired into system, disconnect electrical power at the circuit breaker or fuse box before performing maintenance on the blower.
- ▲ Failure to follow these instructions can result in death, fire or electrical shock.

A WARNING

Injury Hazard

- ▲ Blower surfaces become very hot during operation. Allow blower surfaces to cool before handling.
- ▲ Wear proper eye protection. Air stream from product may contain solid or liquid material that can result in eye or skin damage.
- ▲ Failure to follow these instructions can result in burns, eye injury or other serious injury.
- ▲ It is the customer's responsibility to regularly inspect and make necessary repairs to the blower in order to maintain proper operation. Make sure that pressure and vacuum is released from product before starting maintenance.

Preventive Maintenance

- ▲ After the first 500 hours of operation, the following need to be checked:
 - filter elements
 - · noise absorbing foam used in mufflers
 - · clean motor and blower
- ▲ Replace filter elements as needed. Mufflers should be checked on a monthly basis.



Lubrication Interval

To lubricate the bearings, the roller contact bearings and adjacent bearing housing should have the used grease removed and replaced with fresh grease. About 50 percent of the roller balls should be filled. No more than 65 percent of the adjacent bearing housing should be filled. Sealed bearings should be replaced within the listed conditions below with new bearings or as conditions warrant.

Hours of Service Per Year	Relubrication Intervals
5,000	3 years
Continual Normal Services	1 year
Seasonal Service (motor idle for 6+ months)	1 year at beginning of season
Continuous–high ambients, dirty or moist applications	6 months

Bearing Types

A variety of types and lubricants are used in all Republic Regenerative Blowers. A summary of data is included in the Bearing Specification Table. Greasable bearings are supplied with a sufficient amount of lubricant at the factory to permit initial operation. The frequency of replacing the grease depends upon the conditions and application.

Grease Types

Republic Regenerative Blowers utilize proprietary lubricants from long experience. These lubricants are available from Esso or Exxon. You can check with your local supplier for a recommended equivalent. (High temperature resistance and high speed: NLGI N3 Grade). Lubricants of different manufacturers should not be mixed. If changing lubricant types, the bearing and housing should be thoroughly cleaned to remove all lubricant before adding grease from a new supplier.





Bearing Specification (Recommendable Bearing: NSK C3 Grade)

Single Stage			Double Stage		
Item	Front	Rear	Item	Front	Rear
HRB-101	6203z	6203zz	HRB-102/1		
HRB-201	6204z	020322	HRB-202/1	6203z	6203zz
HRB-301	6205z	6205zz	HRB-302/1		
HRB-401	02002	020022	HRB-402/1	6204z	6205z
HRB-100	6203z	6203zz	HRB-102 *		
HRB-200	6204z	6203zz	HRB-202	6203z	6203zz
HRB-300	6205z		HRB-302		
HRB-400	02032		HRB-402,S	6204z	
HRB-500		6205zz	HRB-502		6205-
HRB-600	6206z		HRB-602	6205z	6205z
HRB-700			HRB-702		
HRB-800		6207zz	HRB-802		
HRB-900	6207z	020122	HRB-902	6206z	
HRB-1000			HRB-1002		6208z
HRB-1100		6208zz	HRB-1102	6207z	
HRB-1200	6208z	8z 620622	HRB-1202	02072	
HRB-1300			HRB-1302		
			HRB-1402	6308z	6308z
			HRB-1502		





Trouble-Shooting Chart

Problem	Reason	Remedy
increased sound	Noise absorbing foam is damaged Impeller rubbing inside	Replace foam Send unit to Republic Authorized Repair Facility
Excessive vibration	Damaged impeller Motor and/or impeller are dirty	Replace impeller Clean motor and impeller periodically
Ambient and exhaust temperature increases	Motor and/or blower are dirty Filters are dirty	Clean motor and blower periodically Replace filters
Decreased inlet air pressure	Inlet air filter is clogged	Clean inlet filter Replace cartridge
Unit is very hot	Wrong wiring Low voltage Inlet air filter is clogged Motor and/or blower are dirty Operating pressure or vacuum is too high	Check wiring Supply proper voltage Clean inlet filter Replace cartridge Clean motor and blower periodically Install a relief valve and pressure or vacuum gauge
Unusual sound	Impeller is damaged or dirty Bearing failure	Clean or replace impeller Send unit to Republic Authorized Repair Facility
Motor overload	Low voltage	Check power source Check wire size and wire connections
Unit does not start	Incorrect electrical connection or power source Impeller is damaged	Check wiring diagram, circuit fusing and circuit capacity Clean or replace impeller Install proper filtration





Republic Regenerative Blowers, when properly installed and operated under normal conditions of use, are warranted by Republic to be free from defects in material and workmanship for a period of twelve [12] months from the date of purchase from Republic or an authorized Republic Representative or Distributor. In order to obtain performance under this warranty, the buyer must promptly (in no event later than 30 days after discovery of the defect) give written notice of the defect to Republic Blower Systems [Fax: 214-631-3673 or E-mail: warranty@republicsales.com] or a representative in your country. Customer is responsible for freight charges to Republic in all cases.

This warranty does not apply to electrical controls and gasoline engines not supplied by Republic and does not extend to any goods or parts which have been subjected to misuse, lack of maintenance, neglect, damage by accident or transit damage.

This express warranty excludes all other warranties or representations expressed or implied by any literature, date or person. Republic's maximum liability under this exclusive remedy shall never exceed the cost of the subject product. Republic reserves the right, at its sole discretion, to refund the purchase price in lieu of repair or replacement.

Republic is not responsible or liable for indirect or consequential damages of any kind however, including but not limited to those for use of any products, loss of time, inconvenience, lost profit, labor charges, or other incidental or consequential damages with respect to persons, business, or property, whether as a result of breach of warranty, negligence or otherwise.

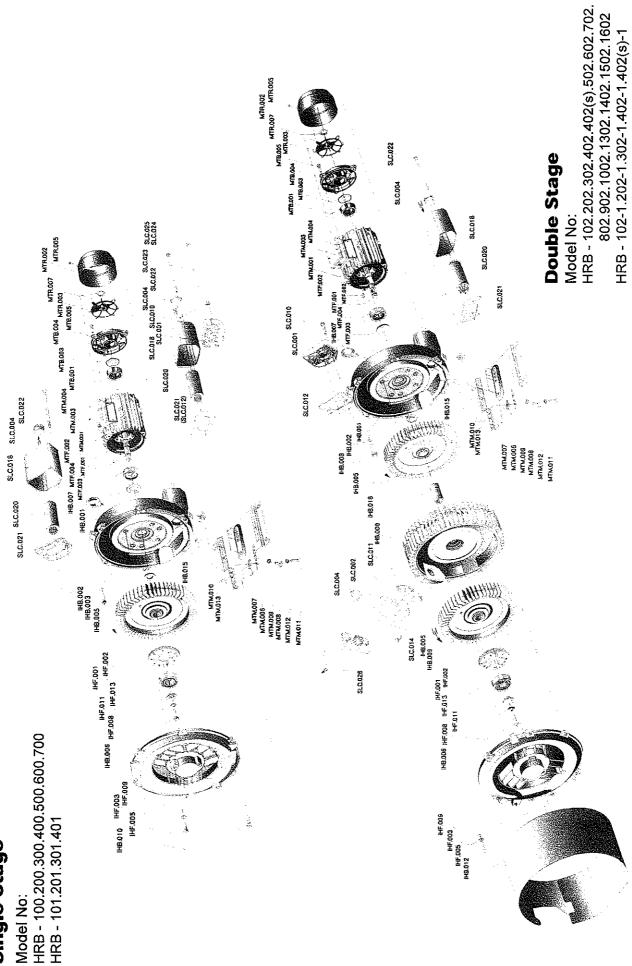
Notwithstanding any other provision of this warranty: Customer's remedy against Republic for goods supplied or for non-deliverable goods or failure to furnish goods, whether or not based on negligence, strict liability or breach of express or implied warranty is limited solely to Republic's option, to replacement of or cure of such nonconforming or non-deliverable goods or return of the purchase price for such goods and in no event shall exceed the price or charge for such goods. Republic expressly disclaims any warranty of merchantability or fitness for a particular use or purpose with respect to the goods sold. There are no warranties that extend beyond the descriptions set forth in this warranty, notwithstanding any knowledge of Republic regarding the use or uses intended to be made of goods, proposed changes or additions to goods, or any assistance or suggestions that may have been made by Republic's personnel. Unauthorized extensions of warranties by the customer shall remain the customer's responsibility.

Customer is responsible for determining the suitability of Republic's products for customer's use or resale, or for incorporating them into objects or applications which customer designs, assemblies, constructs or manufacturers.

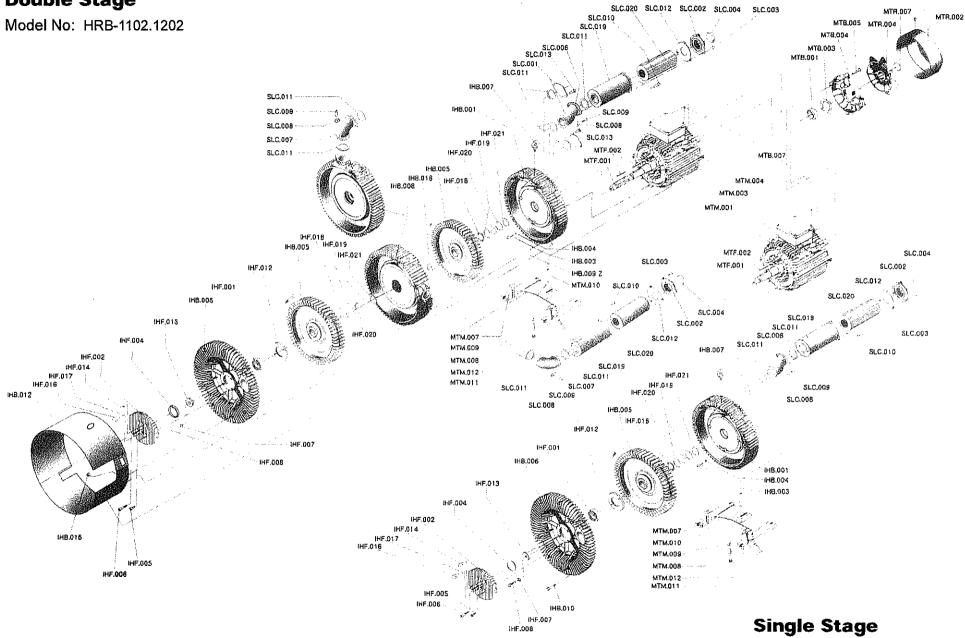
This warranty can be modified only by authorized Republic personnel, by signing a specific written description of any modifications.

Exploded View

Single Stage Model No:



Exploded View Double Stage



MTR.005

Model No: HRB-800.900.1000



Blower Systems

Ring Blower Part List

Part Number	Part Name
IHF.001	Bearing
IHF.002	Bearing Cover
IHF.003	Plain Washer
IHF.004	Spacer Washer
IHF.005	Cheese Head Screw
IHF.006	Socket Head Cap Screw
IHF.007	Lock Plate
IHF.008	Cap Bolt
IHF.009	O-Ring Seal
IHF.011	Spring Washer
IHF.012	Mating Ring
IHF.013	Disc
iHF.014	Grease Nipple
IHF.016	Hexa Head Bolt
IHF.017	Plain Washer
IHF.018	Internal Retaining Ring
IHF.019	Compensate Ring
IHF.020	Spring Washer
IHF.021	Sealing Ring

Part Number	Part Name
IHB.001	Compressor Housing
IHB.002	Spring Washer
IHB.003	Cap Bolt
IHB.004	Spring Washer
IHB.005	Impeller
IHB.006	Compressor Cover
IHB.007	Eye Bolt
IHB.008	Center Section
IHB.009	Threaded Rod
IHB.010	Cheese Head Screw
IHB.012	Compressor Cowl
IHB.015	Disc
IHB.016	Plain washer
IHB.018	Sleeve

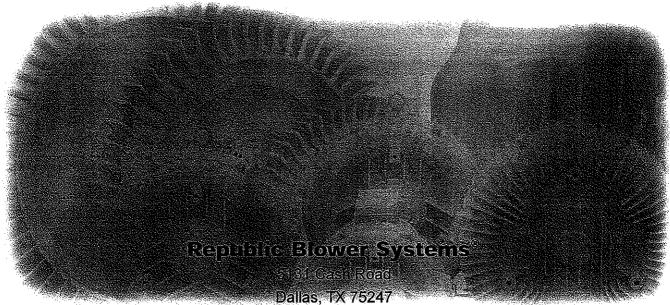
Part Number	Part Name
MTF.001	Compressor Housing
MTF.002	Spring Washer
MTF.003	Cap Bolt
MTF.004	Spring Washer

Part Number	Part Name
MTB.001	Bearing
MTB.003	Resilent Preloading Plate
MTB.004	Endshield
MTB.005	Cheese Head Screw
MTB.007	Hexagonal Nut

Part Number	Part Name
MTM.001	Stator
MTM.003	Rating Plate
MTM.004	Screw
MTM.006	Square Nut
MTM.007	Foot
MTM.008	Hexagonal Head Screw
MTM.009	Spring Washer
MTM.010	Sleeve
MTM.011	Cap Bolt
MTM.012	Spring Washer
MTM.013	Square Nut

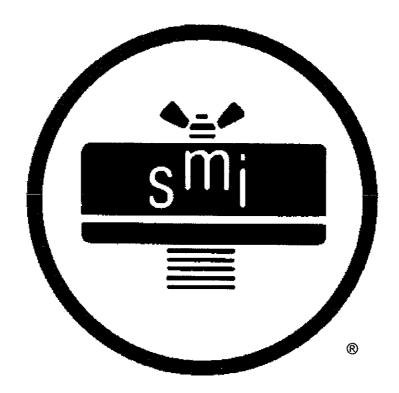
Part Number	Part Name
MTR.002	Fan Cowl
MTR.003	External Fan
MTR.004	External Fan
MTR.005	Screw
MTR.007	Circlip

Part Number	Part Name
SLC.001	Plug
SLC.002	Flange
SLC.003	Cap Bolt
SLC.004	Plug
SLC.005	Hexagonal Nut
SLC.006	Graded Tube
SLC.007	Graded Tube
SLC.008	Clip
SLC.009	Cap Bolt
SLC.010	Cap Bolt
SLC.011	Gasket
SLC.012	Gasket
SLC.013	Cap Bolt
SLC.014	Cap Bolt
SLC.015	Cap Bolt
SLC.016	Cap Bolt
SLC.017	Silencer Casing
SLC.018	Silencer Casing
SLC.019	Silencer Insert
SLC.020	Gasket
SLC.021	Flat Head Screw
SLC.022	Threaded Rod
SLC.023	Hexagon Nut
SLC.024	Hexagon Cap Nut
SLC.025	Silencer



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SOLBERG

Vacuum Filters
Maintenance Manual
CSL, CT, VS, VL,
SM-CT, CSS, and CBL Series

www.solbergmfg.com

Maintenance Manual

SOLBERG Vacuum Filters

CSL, CT, VS, VL, SM-CT, CSS and CBL

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*For Further Information Please Call: 630-773-1363

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Solberg Manufacturing, Inc., 1151 West Ardmore Itasca, IL 60143
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Vacuum Inlet Filters March, 2000



Section A

INTRODUCTION

The purpose of this manual is instruction on the proper assembly and care of Solberg vacuum inlet filters.

! WARNING!

This manual must be read and thoroughly understood before using and caring for this air filter. Failure to comply could result in explosion, product/system contamination or personal injury.

This manual should be used as a supplement to the user's understanding of the proper care needed to maintain a safe and dependable air filter. It is the responsibility of the user to interpret and explain all instructions to persons who do not read or understand English <u>BEFORE</u> they are allowed to maintain and use this filter.

This manual should be readily available to all operators responsible for operation and maintenance of the vacuum inlet filters.

We thank you for selecting products from Solberg Manufacturing, Inc. We are confident that our superior filter designs will exceed your application requirements.

Section B

GENERAL INFORMATION

1. Identification of Solberg Vacuum Inlet Filters.

All Solberg vacuum inlet air filters should have an identification label/nameplate that gives the following information:

Assembly Model # Replacement Element #

(The exception is OEM supplied units. In this case please enter the OEM part numbers below.)

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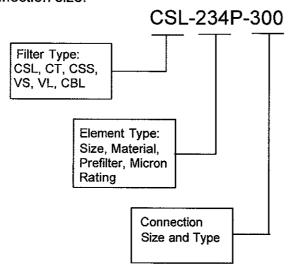
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Vacuum Inlet Filters March, 2000



Fill in the actual nameplate data from your new Solberg inlet filter(s):

No.	Filter Model Number	Replacement Element
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

The model number designates the filter type, the original element configuration and housing connection size. For example, the following part number identifies the filter as being a 'CSL' design filter with a 234 element with prefilter and 3" NPT connection size:



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2. Filtration Rules of Thumb

General: For peak output performance from a compressor, blower, vacuum pump, engine, or any other machine that consumes air, one must have clean, unrestricted air. Proper filtration can help stabilize the working environment within rotating equipment even when the external conditions may be quite severe. A critical component in creating the right working conditions is filter sizing. With the properly sized filter, equipment will run smoothly over its entire expected operating life.

A major factor in filtration and filter sizing is air velocity through the filter media. Generally, the slower the velocity of air through a media the higher the filter efficiency and, conversely, the lower the pressure drop. Therefore, the primary goal in filter sizing is to optimize the velocity of air through the media (sometimes called face velocity).

Rule of Thumb #1: Always begin with the filter cartridge requirements when sizing a filter. Once the appropriate element has been selected then move on to the housing requirements.

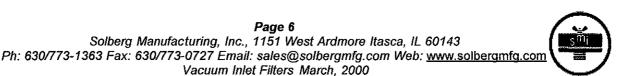
Rule of Thumb #2: Always ask or specify a filter based on a micron rating with filtration efficiencies. As an example, stating a requirement for a 5-micron filter is misleading because no efficiency rating has been specified. A 5-micron filter at 97-% efficiency can be less efficient than a 10-micron filter at 99.7% efficiency. For proper air system performance in light and industrial duty environments, a filter with a minimum of 99.7% filtration efficiency at 10 microns is required.

Rule of Thumb #3: Size your filter correctly by understanding the impact air velocity through a media has on efficiency and pressure drop. Maintain the suggested Air-to-Media ratios listed below based on the external environment listings and Filtration efficiency needs.

Filtration Efficiency Requirements (99+% efficiency)	Environmental Conditions	Air to Media Ratio
Industrial Grade 2-micron Paper	Light Duty (clean, office/warehouse-like)	30 CFM/ ft²
	Industrial Duty (workshop, factory-like)	15 CFM/ft ²
	Severe Duty (Foundry, Construction-like)	10 CFM/ft ²
<i>Industrial Grade</i> 5-micron Polyester	Light Duty (clean, office/warehouse-like)	50 CFM/ft ²
	Industrial Duty (workshop, factory-like)	40 CFM/ft²
	Severe Duty (Foundry, Construction-like)	25 CFM/ft²
<i>Industrial Grade</i> 4-micron Polyester	Industrial Duty (workshop, factory-like)	25 CFM/ft²
	Severe Duty (Foundry, Construction-like)	15 CFM/ ft ²
Industrial Grade 1-micron Polyester	Severe Duty (Foundry, Construction-like)	10 CFM/ft ²
Industrial Grade 0.3-micron HEPA Glass	Light Duty (clean office/warehouse-like)	10 CFM/ft²
	Industrial Duty (workshop, factory-like)	7 CFM/ft ²
	Severe Duty (Foundry, Construction-like)	5 CFM/ft²

Rule of Thumb #4: Pressure drop is also caused by the dirt holding capacity of the element. As the element fills up with dirt, the pressure drop increases. It is important to document the pressure drop across a given filter when it is new and then clean or replace it when the pressure drop increases by 10" to 15" H₂O from the original reading.

Rule of Thumb #5: The inlet connection greatly influences the overall pressure drop of the filter system. To minimize the restriction contributed by an inlet filter, a velocity of 6,000 ft/min or less is suggested through the outlet pipe. The table below lists the suggested flows based on pipe size:



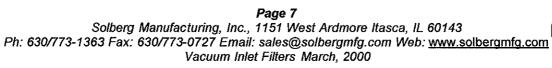
Pipe Size (inches)	Max Airflow	Pipe Size (inches)	Max Airflow	Pipe Size (inches)	Airflow
1/4"	6 CFM	1 1⁄4"	60 CFM	6"	1100 CFM
3/8"	8 CFM	1 ½"	80 CFM	8"	1800 CFM
1/2"	10 CFM	2"	135 CFM	10"	3300 CFM
3/4"	20 CFM	2 1/2"	195 CFM	12"	4700 CFM
1"	35 CFM	3"	300 CFM	14"	6000 CFM
		4"	520 CFM		
		5"	800 CFM		

^{*}Note: This information is for general use only. A qualified engineer must properly design each system.

3. Element Specifications

		Temperature	Filter Change-
Media	Micron Rating	Range	Out Differential
Standard Paper	99+% @ 5 micron	-15 to 220 F	10"-15" H2O Over
·			Initial Delta P
Standard	99+% @ 2 micron	-15 to 220 F	10"-15" H ₂ O Over
Polyester			Initial Delta P
"N" Series	99+% @ 4 micron	-15 to 220 F	10"-15" H2O Over
			Initial Delta P
"Z" Series	99+% @ 1 micron	-15 to 220 F	10"-15" H ₂ O Over
			Initial Delta P
HEPA "HE" Series	99.97% @ 0.3	-15 to 220 F	10"-15" H2O Over
	microns		Initial Delta P
"U" Series	99+% @ 25	-15 to 220 F	10"-15" H₂O Over
	micron		Initial Delta P
"W" Series	99+% @ 100	-15 to 220 F	10"-15" H ₂ O Over
	micron		Initial Delta P
"S1" Series	Stainless Steel	-15 to 220 F	10"-15" H ₂ O Over
	Wire Mesh		Initial Delta P
"AC" & "ACP"	N/A	-15 to 220 F	Change When
Series			Carbon Saturates
"Y" Series	99+% @ 10	-15 to 220 F	10"-15" H ₂ O Over
Polypropylene	micron		Initial Delta P
"MX" & "MXD"	99+% @ 10	-15 to 385 F	10"-15" H2O Over
Series – Nomex	micron		Initial Delta P
Cloth			







4. Element Cleaning

Some types of Solberg inlet filter elements can be cleaned and reused. However, damage can occur to an element during cleaning so it is imperative that care is taken during disassembly, cleaning and re-assembly. Damaged elements can allow particulate bypass, which will damage rotating equipment.

- A. **Polyester Element**: The polyester element may be washed in warm soapy water, vacuumed, gently blown out or replaced. The element should be dry before reinstallation.
- B. **Paper Element**: The paper element may be lightly blown with low pressure air. It is disposable and in most cases should be replaced with a new element.
- C. **Polyurethane Prefilter**: The prefilter may be washed as a sponge or replaced to give the element a longer service life.
- D. **Stainless Steel Wire Mesh Element**. Cleaning instructions similar to polyester, except mild solvents may be used.
- E. Activated Carbon Element. Not cleanable
- F. Polypropylene Element. Cleaning instructions similar to polyester
- G. Nomex Cloth Element. Cleaning instructions similar to polyester

If you are not confident that the integrity of the element was maintained during cleaning, it is recommended that a new element be installed. Also, spare parts such as gaskets, wingnuts and washers can be supplied upon request.

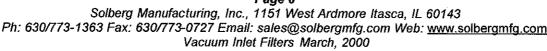
Section C

PROCEDURES

1. Installation.

- A. Maximum inlet gas stream temperature for most Solberg inlet vacuum filter products is 220 degrees F. Temperatures in excess of this could cause damage to elements, media and elastomers.
- B. Direction of flow is typically from the outside of the element to the inside of the element. Most products have arrows indicating direction of flow on inlet and outlet ports.
- C. Ensure that pipe/flange connections are adequately sealed so the potential for leaks is reduced to a minimum.

Page 8





2. Disconnecting canister top from canister base.

- A. VS/VL: Remove V-clamp by loosening Hex Nut or T-bolt and releasing.
- B. CT/Small CSL/CBL: Release wire-form clips.
- C. Large CSL: Loosen wingnut or hex head on T-bolts.
- D. CSS: Twist upper housing to release.
- E. Lift off canister top.

3. Removing element for service/maintenance.

- A. Remove retaining hex head/wing-nut and washer carefully, and then remove element. Some elements will have a top plate that should also be removed. Note: Model "CSS" elements should be free when housing tops are removed.
- B. Clean sealing surfaces of housing, top & base plates, and element endcaps so that they are free of dirt or any other particulate.

! WARNING!

Failure to comply with these instructions may result in system or pump contamination.

4. Securing Element.

- A. Place new or cleaned element evenly on base plate. Be sure element seats properly on base and there is no dirt or particulate present on sealing surfaces.
- B. Place top plate (if necessary) on element by centering on tap bolt.
- C. Secure washer and wing nut to end cap (or top plate) and tap bolt. Element must be tightly secured. Note: DO NOT over tighten!

! WARNING!

Defective installation may cause system or pump contamination. Use only genuine Solberg replacement parts.

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Vacuum Inlet Filters March, 2000

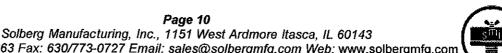


- 5. Securing canister top to canister base.
 - A. Make sure all surfaces are free from dust and other particulate.
 - B. Hemisphere o-ring must rest evenly along canister/casting base o-ring groove.
 - C. VS/VL: Secure V-clamp by disconnecting hex nut or T-bolt portion and placing V-clamp along the diameter of canister o-ring groove. Fasten Tbolt and secure tightly. V-CLAMP LEGS MUST REST UNIFORMLY ALONG ENTIRE O-RING GROOVE.
 - D. CT/Small CSL/CBL: Hold canister housing against o-ring or sealing ring on main filter head. Re-fasten wire-form clips.
 - E. Large CSL: Replace housing top plate. Feed T-bolts into corresponding slots and tighten evenly around perimeter. Note: Do NOT over tighten!
 - F. CSS: Reassemble top housing to bottom housing by aligning tabs and turning into place.

Section D

MAINTENANCE RECOMMENDATIONS

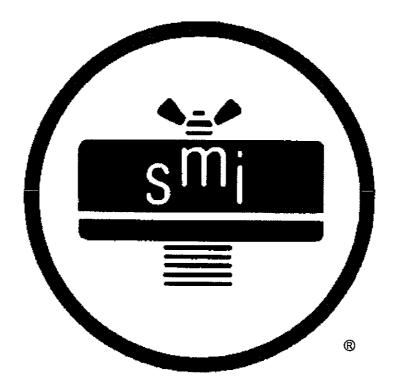
- Pressure drop readings are recommended to have an effective air filter.
 Always document initial pressure drop during start-up when element is clean.
 Replacement cartridge is needed when system experiences 10" to 15" H₂O higher pressure drop above the initial reading. Refer to page 4 for instructions.
- 2. Always check replacement cartridge gaskets to insure they are adhered uniformly along the end caps during handling. If not, contact Solberg Manufacturing, Inc. immediately. Do not modify or change from Solberg specified parts!
- 3. Always check inlets/outlets, element base and its components when replacing element to insure cleanliness. Wipe clean if necessary.
- 4. Operate only when a proper seal exists.
- VS/VL: Never operate without absolute assurance that V-clamp is secured correctly along entire diameter of canisters. Check along V-clamp for wear. Replace if any distortion occurs due to handling and usage.



SPARE PARTS LIST: CSL, CT, VS, VL, CSS, AND CBL

)	Housing						Element	
	İ		T .	Gasket(s)/	Silv		Clips/	 	Wingnuts/	· · · · · · · · · · · · · · · · · · ·
Parent Model	Prefilter	Тор	O-Rina	Adapter	Wingnut(s)	Washer(s)	Bolts	Top Plate	Bolt	Washer(s)
Model-Element-Connection	Model	Model No.	Model No.	Model No.	Model No.	Model No.	Model No	Model No.	Model No.	Model No.
CSS-05/04-xxx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CSS-07/06-xxx	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CSS-11/10-xxx	NVA	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CSL-825/824-xxx	N/A	T824	OR337	BG224	N/A	N/A	CPWF	N/A	N/A	N/A
CSL-843/842-xxx	PF842	T842	OR550	BG268	N/A	N/A	CPWF	N/A	N/A	N/A
CSL-849/848-xxx	PF848	T848	OR675	BG281	N/A	N/A	CPWF	N/A	N/A	N/A
CSL-851/850-xxx	PF850	T850	OR750	BG412	N/A	N/A	CPWF	N/A	N/A	N/A
CSL-239/238-xxx	PF238	TD238	OR1250	N/A	N/A	N/A	CPWF	N/A	WN38X16	WR38X16
CBL-879/878-xxx	PF848	TD848	OR675	N/A	N/A	N/A	CPWF	N/A	WN25X20	WR25X20
CT-235/234-xxx	PF234	N/A	GCT1100	ADCT234	N/A	N/A	CPWF	T8000437	BH38X16	WR38X88
CT-SM3-xxx	N/A	N/A	GCT1100	N/A	N/A	N/A	CPWF	N/A	N/A	N/A
CT-SM4-xxx	N/A	N/A	GCT1100	N/A	N/A	N/A	CPWF	N/A	N/A	N/A
VS-235/234-xxx	PF234	N/A	OR386	N/A	N/A	N/A	N/A	T8000437	WN38X16	WR38X16
VS-245/244-xxx	PF244	N/A	OR386	N/A	N/A	N/A	N/A	T1000437	WN38X16	WR38X16
VS-275/274-xxx	PF274	N/A	OR386	N/A	N/A	N/A	N/A	T12000437	WN38X16	WR38X16
VL-235/234-xxx	PF234	N/A	OR386	N/A	N/A	N/A	N/A	T8000437	WN38X16	WR38X16
VL-245/244-xxx	PF244	N/A	OR386	N/A	N/A	N/A	N/A	T1000437	WN38X16	WR38X16
VL-275/274-xxx	PF274	N/A	OR386	N/A	N/A	N/A	N/A	T12000437	WN38X16	WR38X16
CSL-235/234-xxx	PF234	TC1400	OR1200	N/A	WN38X16	WR38X16	BT38163	T8000437	WN38X16	WR38X16
CSL-335/334-xxx	PF334	TC1400	OR1200	ADEX300	WN38X16	WR38X16	BT38163	T8000437	WN38X16	WR38X16
CSL-245/244-xx	PF244	TC1850	OR1600	N/A	WN38X16	WR38X16	BT38163	T1000437	WN38X16	WR38X16
CSL-345/344-xxx	PF344	TC1850	OR1600	ADEX300	WN38X16	WR38X16	BT38163	T1000437	WN38X16	WR38X16
CSL-275/274-xxx	PF274	TC1850	OR1600	N/A	WN38X16	WR38X16	BT38163	T12000437	WN38X16	WR38X16
CSL-375/374-xxx	PF374	TC1850	OR1600	ADEX300	WN38X16	WR38X16	BT38163	T12000437	WN38X16	WR38X16
CSL-377/376-xxx	PF376	TC2250	OR2000	N/A	WN38X16	WR38X16	BT38163	T14750625	HN50X13	WR50X13
CSL-384(2)-xxx	PF384(2)	N/A	OR2400	N/A	WN38X16	WR38X16	BT38163	T19750625	HN50X13	WR50X13
CSL-685-xxx	PF684	N/A	OR2400	N/A	WN38X16	WR38X16	BT38163	T19750625	HN50X13	WR50X13
CSL-485(2)/484(2)-xxx	PF484(2)	N/A	OR2400	N/A	WN38X16	WR38X16	BT38163	T19750625	HN50X13	WR50X13

^{*}Note: Spare parts are for standard products. See page 4 for replacement element.



SOLBERG

Inlet Filters and Filter Silencers
Maintenance Manual
F, FS, FT, 2G, QB Series

www.solbergmfg.com

Maintenance Manual

Solberg Air Inlet Filters and Filter Silencers F/FS/FT/2G/QB

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*For Further Information Please Call: 630-773-1363



Solberg Manufacturing, Inc., 1151 West Ardmore Itasca, IL 60143 Ph: 630/773-1363 Fax: 630/773-0727 Email: sales@solbergmfg.com Web: www.solbergmfg.com Air Inlet Filters & Filter Silencers March, 2000



Section A

INTRODUCTION

The purpose of this manual is instruction on the proper assembly and care of Solberg inlet air filters.

! WARNING!

This manual must be read and thoroughly understood before using and caring for this air filter. Failure to comply could result in explosion, product/system contamination or personal injury.

This manual should be used as a supplement to the user's understanding of the proper care needed to maintain a safe and dependable air filter. It is the responsibility of the user to interpret and explain all instructions to persons who do not read or understand English <u>BEFORE</u> they are allowed to maintain and use this filter.

This manual should be readily available to all operators responsible for operation and maintenance of the inlet air filters.

We thank you for selecting products from Solberg Manufacturing, Inc. We are confident that our superior filter designs will meet your application requirements.

Section B

GENERAL INFORMATION

1. Identification of Solberg Inlet Air Filters.

All Solberg inlet air filters should have an identification label/nameplate that gives the following information:

Assembly Model # Replacement Element

(The exception is OEM supplied units. In this case, please enter the OEM part numbers below.)

Page 3

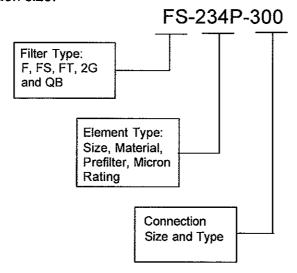
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Fill in the actual nameplate data from your new Solberg inlet filter(s):

No.	Filter Model Number	Replacement Element	Initial Delta P Readings
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

The model number designates the filter type, the original element configuration and housing connection size. For example, the following part number identifies the filter as being a 'FS' design filter with a 234 element with prefilter and 3" NPT connection size:



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2. Filtration Rules of Thumb

General: For peak output performance from a compressor, blower, vacuum pump, engine, or any other machine that consumes air, one must have clean, unrestricted air. Proper filtration can help stabilize the working environment within rotating equipment even when the external conditions may be quite severe. A critical component in creating the right working conditions is filter sizing. With the properly sized filter, equipment will run smoothly over its entire expected operating life.

A major factor in filtration and filter sizing is air velocity through the filter media. Generally, the slower the velocity of air through a media the higher the filter efficiency and, conversely, the lower the pressure drop. Therefore, the primary goal in filter sizing is to optimize the velocity of air through the media (sometimes called face velocity).

Rule of Thumb #1: Always begin with the filter cartridge requirements when sizing a filter. Once the appropriate element has been selected then move on to the housing requirements.

Rule of Thumb #2: Always ask or specify a filter based on a micron rating with filtration efficiencies. As an example, stating a requirement for a 5-micron filter is misleading because no efficiency rating has been specified. A 5-micron filter at 97-% efficiency can be less efficient than a 10-micron filter at 99.7% efficiency. For proper air system performance in light and industrial duty environments, a filter with a minimum of 99.7% filtration efficiency at 10 microns is required.

Rule of Thumb #3: Size your filter correctly by understanding the impact air velocity through a media has on efficiency and pressure drop. Maintain the suggested Air-to-Media ratios listed below based on the external environment listings and Filtration efficiency needs.

Filtration Efficiency Requirements (99%+ efficiency)	Environmental Conditions	Air to Media Ratio
Industrial Grade 2-micron Paper	Light Duty (clean, office/warehouse-like)	30 CFM/ ft²
	Industrial Duty (workshop, factory-like)	15 CFM/ft ²
	Severe Duty (Foundry, Construction-like)	10 CFM/ ft²
<i>Industrial Grade</i> 5-micron Polyester	Light Duty (clean, office/warehouse-like)	50 CFM/ft ²
	Industrial Duty (workshop, factory-like)	40 CFM/ft ²
	Severe Duty (Foundry, Construction-like)	25 CFM/ft ²
<i>Industrial Grade</i> 4-micron Polyester	Industrial Duty (workshop, factory-like)	25 CFM/ft²
	Severe Duty (Foundry, Construction-like)	15 CF M/ft²
<i>Industrial Grade</i> 1-micron Polyester	Severe Duty (Foundry, Construction-like)	10 CFM/ ft²
Industrial Grade 0.3-micron HEPA Glass	Light Duty (Pre-filtered Applications)	10 CFM/ ft²
	Industrial Duty (workshop, factory-like)	7 CFM/ft²
	Severe Duty (Foundry, Construction-like)	5 CFM/ft²

Rule of Thumb #4: Pressure drop is also caused by the dirt holding capacity of the element. As the element fills up with dirt, the pressure drop increases. It is important to document the pressure drop across a given filter when it is new and then clean or replace it when the pressure drop increases by 10" to 15" H₂O above the original reading.

Rule of Thumb #5: The inlet connection greatly influences the overall pressure drop of the filter system. To minimize the restriction contributed by an inlet filter, a velocity of 6,000 ft/min or less is suggested through the outlet pipe. The table below lists the suggested flows based on pipe size:



Pipe Size (inches)	Max Airflow	Pipe Size (inches)	Max Airflow	Pipe Size (inches)	Airflow
1/4"	6 CFM	1 1/4"	60 CFM	6"	1,100 CFM
3/8"	8 CFM	1 1/2"	80 CFM	8"	1,800 CFM
1/2"	10 CFM	2"	135 CFM	10"	3,300 CFM
3/4"	20 CFM	2 ½"	195 CFM	12"	4,700 CFM
1"	35 CFM	3"	300 CFM	14"	6,000 CFM
		4"	520 CFM	1141001	
		5"	800 CFM		

^{*}Note: This information is for general use only. A qualified engineer must properly design each system.

3. Element Specifications

		Temperature	Filter Change-Out
Media	Micron Rating	Range	Differential
Standard Paper	99+% @ 2 micron	-15 to 220 F	10" to 15" H2O Above
			Initial Delta P
Standard	99+% @ 5 micron	-15 to 220 F	10" to 15" H2O Above
Polyester			Initial Delta P
"N" Series	99+% @ 4 micron	-15 to 220 F	10" to 15" H2O Above
			Initial Delta P
"Z" Series	99+% @ 1 micron	-15 to 220 F	10" to 15" H ₂ O Above
			Initial Delta P
HEPA "HE" Series	99.97% @ 0.3	-15 to 220 F	10" to 15" H ₂ O Above
	microns		Initial Delta P
"U" Series	99+% @ 25	-15 to 220 F	10" to 15" H ₂ O Above
	micron		Initial Delta P
"W" Series	99+% @ 100	-15 to 220 F	10" to 15" H2O Above
	micron		Initial Delta P
"S2" Series	Stainless Steel	-15 to 220 F	10" to 15" H2O Above
	Wire Mesh		Initial Delta P
"AC" & "ACP"	N/A	-15 to 220 F	Change When Carbon
Series			Saturates
"Y" Series	99+% @ 10	-15 to 220 F	10" to 15" H2O Above
Polypropylene	micron		Initial Delta P
"MX" & "MXD"	99+% @ 10	-15 to 385 F	10" to 15" H2O Above
Series – Nomex	micron		Initial Delta P
Cloth			

4. Element Cleaning

Some types of Solberg inlet filter elements can be cleaned and reused. However, damage can occur to an element during cleaning so it is imperative that care is taken during disassembly, cleaning and re-assembly. Damaged elements can allow particulate bypass which will damage rotating equipment.

- A. **Polyester Element.** The polyester element may be washed in warm soapy water, vacuumed, gently blown out or replaced. The element should be dry before reinstallation.
- B. *Paper Element*: The paper element may be lightly blown with low pressure air. It is disposable and in most cases should be replaced with a new element.
- C. *Polyurethane Prefilter*: The prefilter may be washed as a sponge or replaced to give the element a longer service life.
- D. **Stainless Steel Wire Mesh Element**. Cleaning instructions similar to polyester, except mild solvents may be used.
- E. Activated Carbon Element. Not cleanable
- F. Polypropylene Element. Cleaning instructions similar to polyester
- G. Nomex Cloth Element. Cleaning instructions similar to polyester

If you are not confident that the integrity of the element was maintained during cleaning, it is recommended that a new element be installed. Also, spare parts such as gaskets, wingnuts and washers can be supplied upon request.

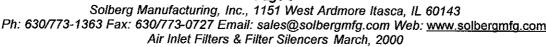
Section C

PROCEDURES

1. Installation.

- A. Maximum operating temperature for most Solberg inlet air filter products is 220 degrees F. Temperatures in excess of this could cause damage to elements, media and elastomers. High temperature products are available.
- B. Direction of flow is typically from the outside of the element to the inside of the element. Most products have arrows indicating direction of flow on the inlet and outlet ports.
- C. Ensure that pipe/flange connections are adequately sealed so the potential for leaks is reduced to a minimum.

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2. Disconnecting canister top from canister base.

- A. FS-04-06-10 (or 05-07-11): Twist top housing to open. Use care to support bottom housing while removing top housing. Fitting damage can occur if fitting is torqued in the wrong direction.
- B. Small F/FS/FT/QB: Remove weather hood or top plate by loosening hex nut or wing nut and lifting off.
- C. Large F/FS/FT/2G/QB: Remove weather hood by loosening hex nut or wing nut and lifting off.

3. Removing element for service/maintenance.

- A. Carefully remove retaining hex head/wing-nut and washer over top plate, and then remove element. Note: Model "04-06-10" elements should be free when housing tops are removed.
- B. Clean sealing surfaces of housing, top plates and element endcaps so that they are free of dirt or any other particulate.

! WARNING!

Failure to comply with these instructions may result in system or equipment contamination.

4. Securing Element.

- A. Place new or cleaned element evenly on base plate. Be sure element seats properly on base and there is no dirt or particulate present on sealing surfaces. With multiple element stacks place elements in line with base element and ensure elements seat properly.
- B. Place top plate (if necessary) on element by centering on tap bolt.
- C. Secure washer and wing nut to end cap (or top plate) and tap bolt. Element must be tightly secured. Note: Do NOT over tighten!

Page 9



! WARNING!

Defective installation may cause system or pump contamination. Use only genuine Solberg replacement parts.

- 5. Securing canister top to canister base.
 - A. Make sure all surfaces are free from dust and other particulate.
 - B. Small F/FS/FT/QB: Replace top plate and/or weather hood if necessary. Feed threaded rod into corresponding bolthole and tighten. Note: Do NOT over tighten!
 - C. Large F/FS/FT/QB/2G: Replace top plate and/or weather hood. Feed threaded rod into corresponding bolt hole(s) and tighten. Note: Do NOT over tighten!
 - D. FS-04-06-10 (or 05-07-11): Reassemble top housing to bottom housing by aligning tabs and turning into place.

Section D

MAINTENANCE RECOMMENDATIONS

- Pressure drop readings are recommended to have an effective air filter.
 Always document initial pressure drop during start-up when element is clean.
 Replacement cartridge is needed when system experiences 10" to 15" H₂O above drop above the initial reading. Refer to page 4 for initial values.
- 2. Always check replacement cartridge gaskets to insure they are adhered uniformly along the end caps during handling. If not, contact Solberg Manufacturing, Inc. immediately. Do not modify or change!
- 3. Always check inlets/outlets, element base and its components when replacing element to insure cleanliness. Wipe clean if necessary.
- 4. Operate only when a proper seal exists.

Page 10

Solberg Manufacturing, Inc., 1151 West Ardmore Itasca, IL 60143
Ph: 630/773-1363 Fax: 630/773-0727 Email: sales@solbergmfg.com Web: www.solbergmfg.com
Air Inlet Filters & Filter Silencers March, 2000



SPARE PARTS LIST:

F/FS/FT/2G/QB

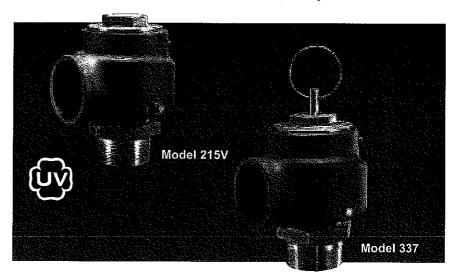
		Housing Wea	atherhood/Top	Element			
Parent Model	Prefilter	for FS Series	for 2G/QB Series	Top Plate	Wingnut(s)	Hex Nut(s)	Washer(s)
FS/2G/QB-Element-Connection	Model	Model No.	Model No.	Model No.	Model No.	Model No.	Model No.
Model-05/04-xxx	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Model-07/06-xxx	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Model-11/10-xxx	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Model-15/14-xxx	PF14	WH6X2	N/A	N/A	WN25X20	N/A	WR25X20
Model-19/18-xxx	PF18	WH6X5	QB6X5	N/A	WN25X20	N/A	WR25X20
Model-31/30-xxx	PF30	WH10X5	QB10X5	N/A	WN25X20	N/A	WR25X20
Model-231/230-xxx	PF230	WH10X10	QB10X10	N/A	WN38X16	N/A	WR38X16
Model-235/234-xxx	PF234	WH16X10	QB16X10	N/A	WN38X16	N/A	WR38X16
Model-245/244-xxx	PF244	WH16X10	QB16X10	N/A	WN38X16	N/A	WR38X16
Model-275/274-xxx	PF274	WH16X10	QB16X10	N/A	WN38X16	N/A	WR38X16
Model-375/374-xxx	PF374	T16000625	T16000625	T12000625	WN50X13	HN50X13	WR50X13
Model-377/376-xxx	PF376	T22000625	T22000625	T14750625	WN50X13	HN50X13	WR50X13
Model-385/384-xxx	PF384	T28000625	T28000625	T19750625	WN50X13	HN50X13	WR50X13
Model-384(2)-xxx	PF384(2)	T28000625	T28000625	T19750625	WN50X13	HN50X13	WR50X13
Model-485/484-xxx	PF484	T28000625	T28000625	T19750625	WN50X13	HN50X13	WR50X13
Model-485(2)/484(2)-xxx	PF484(2)	T28000625	T28000625	T19750625	WN50X13	HN50X13	WR50X13
Model-685-xxx	PF684	T28000625	T28000625	T19750625	WN50X13	HN50X13	WR50X13

		Weatherhood/Top	Element Top	Top			
Parent Model	Prefilter	for F Series	for F Series	for FT Series	Wingnut(s)	Hex Nut(s)	Washer(s)
F/FT-Element-Connection	Model	Model No.	Model No.	Model No.	Model No.	Model No.	Model No.
Model-15/14-xxx	PF14	WH6X2	N/A	T4500312	WN25X20	N/A	WR25X20
Model-19/18-xxx	PF18	WH6X5	N/A	T4500312	WN25X20	N/A	WR25X20
Model-31/30-xxx	PF30	WH7.625X5	N/A	T6000312	WN25X20	N/A	WR25X20
Model-231/230-xxx	PF230	WH10X10	N/A	T6000375	WN38X16	N/A	WR38X16
Model-235/234-xxx	PF234	WH10X10	N/A	T8000437	WN38X16	N/A	WR38X16
Model-245/244-xxx	PF244	WH16X10	N/A	T1000437	WN38X16	N/A	WR38X16
Model-275/274-xxx	PF274	WH16X10	N/A	T12000437	WN38X16	N/A	WR38X16
Model-375/374-xxx	PF374	WH16X16	N/A	T12000625	WN50X13	HN50X13	WR50X13
Model-377/376-xxx	PF376	WH22.5X15	N/A	T14750625	WN50X13	HN50X13	WR50X13
Model-385/384-xxx	PF384	WH28X15	N/A	T19750625	WN50X13	HN50X13	WR50X13
Model-384(2)-xxx	PF384(2)	T28000625	T19750625	T19750625	WN50X13	HN50X13	WR50X13
Model-485/484-xxx	PF484	WH28X24	N/A	T19750625	WN50X13	HN50X13	WR50X13
Model-485(2)/484(2)-xxx	PF484(2)	T28000625	T19750625	T19750625	WN50X13	HN50X13	WR50X13
Model-685-xxx	PF684	T28000625	T19750625	T19750625	WN50X13	HN50X13	WR50X13

*Note: Spare parts are for standard products. See page 4 for replacement element.



Models 215V, 337 Model 337 is ASME Section VIII, Air/Gas vacuum, 'UV' National Board Certified, Safety Valves



Pressure and Temperature Limits

Model 337:

1 to 60 psig [0.07 to 4.1 barg] -20° to 406°F [-29° to 208°C]

Vacuum Limits

Model 215V:

2-inch HG to 29-inch HG [67.7 to 982 mbarg] -20° to 400°F [-29° to 205°C]

Applications

- Protection of low to medium pressure high volume blowers, compressors and pneumatic conveying systems.
- Bulk hauling trailers/equipment.
- Light gauge tanks.
- Protection of high volume vacuum pumps and conveying systems.

Features and Benefits

- Large nozzle design provides high capacity.
- Flat bronze valve seats are lapped for optimum performance.
- Warn ring offers easy adjustability for precise opening with minimum preopen or simmer and exact blowdown control.
- Pivot between disc and spring corrects misalignment and compensates for spring side thrust.

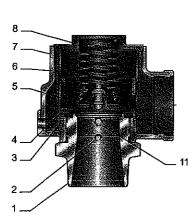
Model Descriptions

- Model 337 has 'pull-ring' lift device for easy manual testing.
- Every valve is 100% tested/inspected for pressure setting, blowdown and leakage.
- All adjustments are factory sealed to prevent tampering or disassembly.

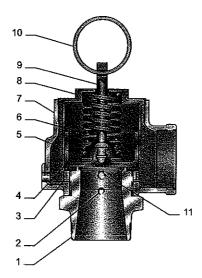
Option

SS trim. (nozzle and disc) (Variation 03)

/lodels 215V, 337





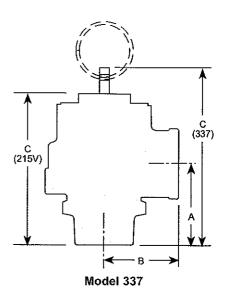


Model 337

No.	Part Name	215V	337
	Nozzle 1	Bronze, B62	Bronze, B62
2	Set Screw	Steel A108-1018 Brass Plated	Steel A108-1018 Brass Plated
3	Regulator Ring	Bronze B584 Alloy 84400	Bronze B584-C84400
4	Disc [†]	Bronze B584 Alloy 84400	Bronze B584-C84400
5	Spring Step	Steel A-109 Cadmium Plated	Steel A109, CAD Plated
6	Spring	SS, A313 TY 302	SS A313-302
7	Body	Cast Iron, Zinc Plated, B633	Iron A-126, CL A or B
8	Compression Screw	Bronze, B-584 Alloy 84400	Bronze, B584-C84400
9	Stem ²	N/A	Brass B16
10	Lift Ring ²	N/A	SS A313-302
11	Regulator Ring Set Screw	N/A	Brass B16

Size Inlet — Dimensions, in [mr					Weight	
and Outlet	A	В	C 215V	C 337	ib [kg]	
2" [50.8 mm]	31/4 [82.5]	3 [76.2]	61/2 [165.1]	7 [177.8]	8 [3.6]	
21/2" [63.5 mm]	33/4 [95.2]	31/2 [88.9]	75/8 [194.6]	8 [203.2]	12 [5.4]	
3" [76.2 mm]	41/4 [107.9]	4 [101.6]	81/2 [215.9]	9 [228.6]	20 [4.1]	

- Disc and nozzle available in SSA-479 TY 316
- 2. Stem and lift ring available on Model 337 only.



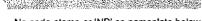
Model 215V

Relief Set	Valve Inlet and Outlet Size						
(in, HG)	2" Orifice Area, in ² 1.84	2 ¹ /2" Orifice Area, in ² 2.79	3" Orifice Area, in ² 4.04				
2	229	347	503				
5	338	512	742				
10	415	630	912				
15	426	646	936				
20	426	646	936				

Non-rode Vacu	ium Air [Metric, Nm	9/h]		
Relief Set [mbarg]	5.08 cm Orifice Area [11.86 cm²]	/alve Inlet and Outlet Si: 6.35 cm Orifice Area [17.97 cm²]	e 7.62 cm Orifice Area [26.05 cm²]	
50	328	498	722	
100	450	682	988	
150	533	807	1170	
200	593	899	1303	
250	638	966	1400	
300	669	1014	1470	
350	690	1046	1516	
400	701	1062	1540	
450	704	1067	1546	
500	704	1067	1546	
550	704	1067	1546	
600	704	1067	1546	
650	704	1067	1546	
700	704	1067	1546	
750	704	1067	1546	

Jodel 337

et Pressure	Valve Inlet and Outlet Size				
(psig)	2"	21/2"	3"		
1	240	364	527		
5	531	805	1166		
10	741	1124	1628		
15	948	1436	2081		
20	1092	1656	2399		
25	1237	1875	2718		
30	1382	2095	3036		
35	1542	2337	3386		
40	1701	2578	3736		
45	1860	2820	4086		
50	2020	3061	4436		
55	2179	3303	4786		
60	2338	3544	5136		



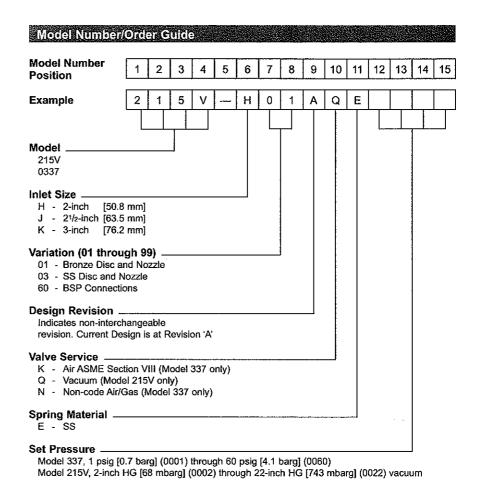
^{..} No code stamp or 'NB' on nameplate below 15 psig set.

Non-code and A	SME Section VIII A	ir [Metric, Nm³/h]	
Set Pressure [barg]	———— V 50 mm	alve Inlet and Outlet Siz 63 mm	ze ———— 80 mm
0.5	1049	1589	2303
1.0	1457	2208	3200
1.5	1888	2861	4147
2.0	2235	3387	4910
2.5	2613	3959	5739
3.0	2995	4538	6579
3.5	3377	5117	7418
4.0	3760	5696	8258

Note

 No code stamp or 'NB' on nameplate below 1.1 barg set.

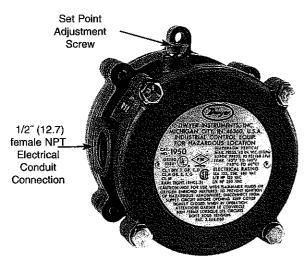
Models 215V, 337





Series 1950 Explosion-Proof Differential Pressure Switches

Specifications - Installation and Operating Instructions



Series 1950 Explosion-Proof Differential Pressure Switches combine the best features of the Dwyer Series 1900 Pressure Switch with an integral explosion-proof and weather-proof housing. Each unit is UL & CSA listed; FM approved for use in Class I, Groups C & D; Class II, Groups E, F, & G; and Class III atmospheres (NEMA 7 & 9). They are totally rain-tight for outdoor installations. Twelve models allow set-points from .03 to 20 inches w.c. and from .5 to 50 psi (3.4 to 345 kPa).

Easy access to the SPDT switch for electrical hook-up is provided by removing the top plate of the three-part aluminum housing. Adjustment to the set point of the switch can be made without disassembling the housing. The unit is very compact, about half the weight and bulk of equivalent conventional explosion-proof switches.

CAUTION

For use only with air or compatible gases. Use of the Model 1950 switch with explosive media connected to the Low pressure port (including differential pressure applications in such media) is not recommended. Switch contact arcing can cause an explosion inside the switch housing which, while contained, may render the switch inoperative. If switch is being used to sense a single positive pressure relative to atmosphere, run a line from the low pressure port to a non-hazardous area free of combustible gases. This may increase response time on -0 and -00 models.

NOTE: The last number-letter combination in the model number identifies the switch's electrical rating (number) and diaphragm material (letter). The 2F combination is standard as described in the physical data above. In case of special models, a number 1 rating is the same as 2; a number 3 or 4 rating is 10A 125, 250, 480 VAC; ½ H.P. 125 VAC; ¼ H.P. 250 VAC; a number 5 or 6 rating is 1A 125 VAC. Letter B indicates a Buna-N diaphragm; N = Neoprene; S = Silicone; and V = Viton®.

UL and CSA Listed, FM Approved For

CL. I GR. C, D - CL. II GR. E, F, G - CL. III

Series 1950 Switches

Operating ranges and deadbands

To order specify	Operating Range:	Approximate Dead Band		
Model Number	inches, W.C.	At Min. Set Point	At Max. Set Point	
1950-02-2S	0.03 to 0.10	0.025	0.05	
1950-00-2F	0.07 to 0.15	0.04	0.05	
1950-0-2F	0.15 to 0.5	0.10	0.15	
1950-1-2F	0.4 to 1.6	0.15	0.20	
1950-5-2F	1.4 to 5.5	0.3	0.4	
1950-10-2F	3.0 to 11.0	0.4	0.5	
1950-20-2F	4.0 to 20.0	0.4	0.6	
Model	Operating	Approximate Dead Band		
Number	Range: PSI	Min. Set Point	Max. Set Point	
1950P-2-2F	0.5 to 2.0	0.3 psi	0.3 psi	
1950P-8-2F	1.5 to 8.0	1.0 psi	1.0 psi	
1950P-15-2F	3.0 to 15.0	0.9 psi	0.9 psi	
1950P-25-2F	4.0 to 25.0	0.7 psi	0.7 psi	
1950P-50-2F	15.0 to 50	1.0 psi	1.5 psi	

SPECIFICATIONS

Service: Air and non-combustible, compatible gases.

Wetted Materials: Consult factory.

Temperature Limits: -40 to 140°F (-40 to 60°C); 0 to 140°F (-17.8 to 60°C) for 1950P-8, 15, 25, and 50. -30 to 130°F (-34.4 to 54.4°C) for 1950-02.

Pressure Limits:

Continuous: 1950's - 45" w.c. (0.11 bar);

1950P's - 35 psi (2.41 bar); 1950P-50 only - 70 psi (4.83 bar). Surge: 1950's - 10 psi (0.69 bar), 1950P's - 50 psi (3.45 bar),

1950P-50 only - 90 psi (6.21 bar).

Enclosure Rating: IP64, NEMA 3, 7 and 9. Switch Type: Single-pole double-throw (SPDT).

Electrical Rating: 15 A @, 125, 250, 480 VAC, 60 Hz. Resistive

1/8 HP @ 125 VAC, 1/4 HP @ 250 VAC, 60 Hz.

Electrical Connections: 3 screw type, common, normally open

and normally closed.

Process Connections: 1/8" female NPT.

Mounting Orientation: Diaphragm in vertical position. Consult

factory for other position orientations.

Set Point Adjustment: Screw type on top of housing. **Weight:** 3.25 lb (1.5 kg); 1950-02 model, 4.4 lb (2 kg).

Agency Approvals: CE, UL, CSA, FM.

RESPONSE TIME: Because of restrictive effect of flame arrestors, switch response time may be as much as 10-25 seconds where applied pressures are near set point.

1950 Switch Outline Dimensions

INSTALLATION

- 1. Select a location free from excess vibration and corrosive atmospheres where temperatures will be within the limits noted under Specifications on reverse. Switch may be installed outdoors or in areas where the hazard of explosion exists. See reverse for specific types of hazardous service.
- 2. Mount standard switches with the diaphragm in a vertical plane and with switch lettering and Dwyer nameplate in an upright position. Some switches are position sensitive and may not reset properly unless they are mounted with the diaphragm vertical.
- 3. Connect switch to source of pressure, vacuum or differential pressure. Metal tubing with 1/4" O.D. is recommended, but any tubing which will not restrict the air flow can be used. Connect to the two 1/8" female NPT pressure ports as noted below:
 - A. Differential pressures connect pipes or tubes from source of greater pressure to high pressure port marked HIGH PRESS, and from source of lower pressure to low pressure port marked LOW PRESS.
 - B. Pressure only (above atmospheric pressure) connect tube from source of pressure to high pressure port. The low pressure port is left open to atmosphere.
 - C. Vacuum only (below atmospheric pressure) connect tube from source of vacuum to low pressure port. The high pressure port is left open to atmosphere.
- 4. To make electrical connections, remove the three hex head screws from the cover and after loosening the fourth captive screw, swing the cover aside. Electrical connections to the standard single pole, double throw snap switch are provided by means of terminals marked "COM" (common), "NO" (norm open), "NC" (norm closed). The normally open contacts close and the normally closed contacts open when pressure increases beyond the set point. Switch loads for standard models should not exceed the maximum specified current rating of 15 amps resistive. Switch capabilities decrease with an increase in ambient temperature, load inductance, or cycling rate. Whenever an

application involves one or more of these factors, the user may find it desirable to limit the switched current to 10 amps or less in the interest of prolonging switch life.

ADJUSTMENT: To Change the Set point

- Remove the plastic cap and turn the slotted Adjust-ment Screw at the top of the housing clockwise to raise the set point pressure and counter-clockwise to lower the set point. After calibration, replace the plastic cap and re-check the set point.
- 2. The recommended procedure for calibrating or checking calibration is to use a "T" assembly with three rubber tubing leads, all as short as possible and the entire assembly offering minimum flow restriction. Run one lead to the pressure switch, another to a manometer of known accuracy and appropriate range, and apply pressure through the third tube. Make final approach to the set point very slowly. Note that manometer and pressure switch will have different response times due to different internal volumes, lengths of tubing, fluid drainage, etc. Be certain the switch is checked in the position it will assume in use, i.e. with diaphragm in a vertical plane and switch lettering and Dwyer nameplate in an upright position.
- 3. For highly critical applications check the set point adjustment and if necessary, reset it as noted in step A.

MAINTENANCE

The moving parts of these switches need no maintenance or lubrication. The only adjustment is that of the set point. Care should be taken to keep the switch reasonably clean. Periodically the vent drain plug should be rotated, then returned to its original position. This will dislodge deposits which could accumulate in applications where there is excessive condensation within the switch. The Series 1950 Explosion-Proof Differential Pressure Switch is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

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OPERATION & MAINTENANCE MANUAL

AMETEK

ROTRON® INDUSTRIAL PRODUCTS

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elephone: 845-246-3401 Fax: 845-246-3802

mak retrofordutkial@anotek.com website; warrestorduskial.com

Air Flow Meter -

Thank you for purchasing an AMETEK Rotron Flow Meter. When matched with the correct Rotron blower, and properly installed and maintained, this meter will quickly and accurately measure the pipe flow. To ensure good results, please take the time to read these instructions before starting the installation of your air flow meter.

Sizing for Optimal Efficiency

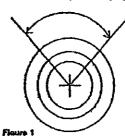
CURRENT A	CURRENT MODELS					GAUGE	Booy	Paion Mo	SEG				
Model	PART#	RANGE (SCFM)	THREADS LENGTH WIDTH	Wioth .	PART#	STYLE	MODEL	PART					
FM20C030O	550599	6-30				550321		FM20A030Q	550312				
FM20C045Q	550600	9-45	2.0	6.94*	5,49°	550322	A	FM20A045Q	550313				
FM20C065Q -	550601	13-65	11.5 NPSC			550323		FM20A065Q	550314				
FM20C125Q	550602	25-125	0.00		-	550290		FM20A125Q	550256				
FM20C175Q	550603	35-175	2.0° 11.5 NPSC		1		(5.34*	5.49	550291	В	FM20A175Q	550255
FM20C225Q	550604	45-225		NPSC		550292		FM20A225Q	550254				
FM30C250O	550605	50-250	0.00			550293		FM30A250Q	550259				
FM30C350Q	550606	70-350	3.0° 8.0 NPSC					7.38*	7,62	550294	С	FM30A350Q	550258
F)430C475Q	550607	95-475		an usar	:	550295		FM30A475Q	550257				
FM40C450Q	550608	90-450	4.0°			550296		FM40A450Q	550262				
FM40C600Q	550609	120-600		7.68*	7.68* 8.62*	559297	D	FM40A600Q	550261				
FM40C850Q	550610	170-850	8.0 NPSC			550298		FM40A850Q	550260				

<u>installation</u>

- 1. Piping The flow meter should be installed horizontally on the inlet side of the blower. Since this device is directional, please observe the flow direction arrow. Rotron suggests using a length of straight pipe equivalent to three to five pipe diameters prior to the meter for any elbows, valves, etc., unless there is a tee. If there is a tee, the suggested equivalent length is eight to ten pipe diameters. The flow meter should have two pipe diameters of straight pipe after the flow exits the meter before any elbows, tees, valves, etc.
- Continuous Service Moisture and debris should not be allowed to enter the tubes leading into the gauge, as it may affect the gauge. Orient the gauge between 10 o'clock and 2 o'clock when viewed from end. (See Figure 1).

If the gauge does not read zero, gently press down on gauge cover while turning counterclockwise to remove cover. Zero the gauge with the Alien wrench and reattach cover.

INSTALL GAUGE 10 O'CLOCK TO 2 O'CLOCK

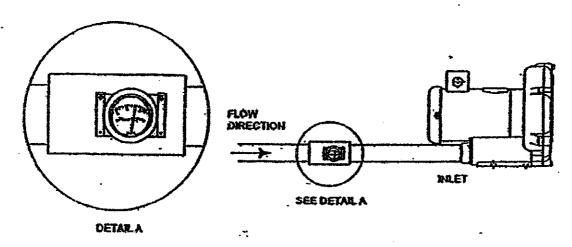


3. Interchangeability - Gauges within a body style are interchangeable to better match your systems actual flow rate to the Gauge Scale. For example:

Body Style	Gauges Available	Flow Range Available
A	550599	6-30 SCFM
Α	550600	9-45 SCFM
. A	550601	13-65 SCFM

Similar options for each body style are available Gauges may be purchased separately and field installed without removing the flow meter from the piping.

Typical Arrangement



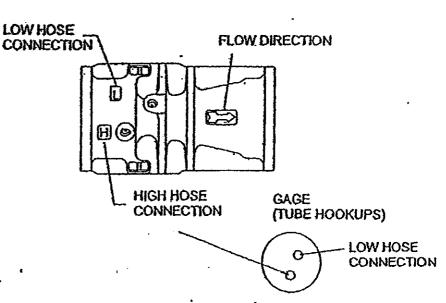
<u>Öperation</u>

Rotron's Flow Meter is a venturi style design. After air enters the inlet, the pressure is measured in the high-pressure tap. The second tap measures the pressure at the throat. The differential between the taps registers across a specially calibrated gauge to provide accurate readings. The throat is then expanded back to the original size to keep pressure loss to under 2-4 IWG.

<u>Maintenance</u>

This air flow meter has been designed to require minimal maintenance. During normal operation, little maintenance is required. Care should be taken to ensure no debris enters the meter.

If the tubes become plugged, remove and clean. Do not switch the low and high hoses. Note proper orientation of hoses.



AIR WATER SEPARATOR PARTS LIST



File Name: Customer: Site Reference: Date:

Generated by:

Parts List
GWTT
ROCKAWAY NJ
11/24/2009
BGG

Reference	Qty	Units	Description	Material	Part Number
MOISTURE	1	each	30 GALLON SEPARATOR WITH MANUAL 3/4" DRAIN VALVE, 20"	18 GA STEEL	PLC-MDXX-WSD30-XXS
SEPARATOR			Hg MAX, LINED		
LSH	1	each	LEVEL SWITCH, VERTICAL, SINGLE LEVEL SWITCHING,	BRASS/ACET	PLC-SDA0-SFT275
			CABLE RESTRAINT MOUNT, 50' TFFN CORD, ACETAL FLOAT,	AL	
			BRASS BODY		
VI	1	each	GAUGE, VACUUM, 0-100" WC 2 1/2" DIAL 1/4" MNPT CBM -20-	PS/CU,BR,PS,	Ashcroft-
			180°F	RTV	251490A02BXXX100"H2OVAC

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Air/Water Separator Operation and Maintenance

SECTION INCLUDES

- 1.1 Application
- 1.2 Receiving and Unpacking
- 1.3 Tools required
- 1.4 Installation
- 1.5 Operation
- 1.6 Maintenance
- 1.7 Troubleshooting

1.1 APPLICATION

- a) Product Level Control's air/water separators are designed to remove water from moisture-laden air streams. Proper selection and sizing of your air/water separator will ensure effective operation and longevity
- b) Appurtenances required in addition to an air/water separator include:
 - i) High water level switch. The high level switch will shut down the airflow when the separator becomes full of water.
 - ii) Vacuum relief valve. The vacuum relief valve protects the separator from over pressurization.
 - iii) Inline filter. The inline filter protects downstream equipment from foreign particles.

c) Air/water separator model number description: Vessel Type D-Dow Vacuum Rated, flat head (up to 20" Hg vacuum use) R-High Vacuum Rated, flat head [rated for full vacuum] A-Air Receiver Tank, domed head [rated for full vacuum] Vessel Size, Nominal Gallons [Low Vacuum = 30,55, 85, 110] [High Vacuum = 30 - 200] custom sizes available for High Vacuum models only Separation Technology S-Standard, Cyclonic C-High Efficiency, Cyclonic [99% efficient for 150 micron & larger droplets] M-Extra High Efficiency, Mist Eliminator [99.9% efficient for 50 micron & larger droplets] Flow, ICFM or ACFM please request PLC's assistance if conversion is required Operational Vacuum, Inches of Mercury Vacuum Options [Available to all models] GA-Gauge PC-Pump Control Level Switches ST-Sight Tube XC-Protective Internal Coating TF-Jank Full Switch **BC-Ball Float Check Valve** MDXX-WS ___ -XX ___ - __ -

1.2 RECEIVING AND UNPACKING

- a) Upon receiving the unit, inspect carefully for any damage that may have occurred during shipment.
- b) Shipping damage claims must be filed with the carrier at time of delivery. 1.3 TOOLS REQUIRED
 - i) No special tools are required to install the unit. Some separators can be heavy. Make sure you have appropriate equipment to place the separator in position.

1.4 INSTALLATION

- a) Secure separator to floor. Separator must be mounted vertically and secured to prevent movement during operation.
- b) Connect inlet and discharge piping to the separator. Inlet is horizontal while the outlet is on top. Use flexible couplings to avoid transferring vibration and stress to separator. Inlet and discharge piping must be secured such that the separator does not support the weight of the piping. Note: Keep in mind the weight of the pipe and its contents (air and water) when installing pipe supports.
- c) Install water level switch (es). This switch is either installed in a sight tube or directly through the wall of the separator. Install and wire switch according to manufacturer's instructions and local codes. Typically this switch is wired to a control panel to control either a transfer pump or shut the system down when the separator becomes full of water.
- d) Install and adjust vacuum relief valve according to manufacturer's instructions. Set the vacuum relief valve at the lowest of the following values: maximum vacuum rating of the vacuum blower, or maximum vacuum that can be applied to the separator. For separator models MDXX-WSR and MDXX-WSA, the vacuum relief valve can be set at full vacuum, or 28" mercury vacuum. For separator models MDXX-WSD (drum type), set the vacuum relief valve at 20" mercury vacuum. Note these are the maximum vacuum levels the separators can handle.
- e) In cold climates, prevent the separator from freezing. Catastrophic failures can occur if water in the separator or water in transmission piping freezes.

1.5 OPERATION

- a) Moisture-laden air enters the air/water separator through the horizontal inlet. After entering the separator, tangential forces created by cyclonic motion remove free moisture contained in the air stream. This separated moisture falls to the bottom of the separator as a liquid due to gravity. Air continues to swirl around the separator until it reaches the discharge at the top.
- b) Manually drain the separator by opening the drain valve. It may be necessary to turn off the vacuum blower in order to allow the water to drain from the separator. This water may be considered hazardous waste. Be sure to wear appropriate safety clothing and follow proper procedures for disposal. Some locations require this water to be treated before discharge.

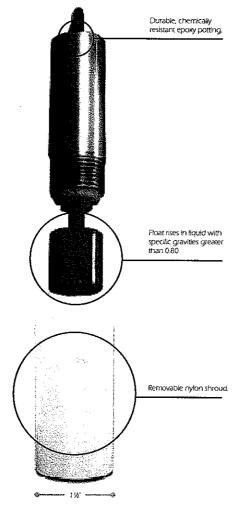
c) For systems with automatic water pump out: Water level switches will automatically operate the water transfer pump to empty the separator. Be sure the transfer pump is primed before operation. Also consult the transfer pump's literature for specific operating instructions. As stated above, this water may be hazardous. Follow above guidelines for disposal.

1.6 MAINTENANCE

- a) Product Level Control's air/water separators require minimal maintenance.
- b) Gain access to the interior of the separator through the removable lid or the clean out port. Lids are removed by removing the bolt and band at the top of the separator, remove discharge piping, and then remove the lid while being careful to prevent damage to the gasket. When reinstalling the lid, carefully place the gasket, ring, and tighten the bolt until the ends of the ring are ½" apart. White tightening the bolt, tap the band horizontally with a hammer on the side opposite the bolt. If lid leaks, bolt may be tightened slightly more and silicone can be applied to gasket.
- c) Periodically, a layer of sludge may form on the bottom of the separator. Remove the top lid of the separator and remove the sludge with water. Remember this sludge may be considered hazardous so be sure to wear appropriate safety clothing. If the separator does not contain a removable lid, gain access through the clean out port located on the side of the separator and remove the sludge as indicated above.
- d) If your separator contains a high efficiency demister, periodically check the pressure drop across the separator. If the pressure drop increases to an unacceptable value, or when the separator's performance decreases, remove the demister and clean with an appropriate solution. Do not unwrap the demister. If the demister is unwrapped and then rewrapped, performance will be sacrificed.
- e) Periodically, consult the maintenance instructions for the vacuum relief valve. Also, verify the vacuum setting in order to protect the separator.



Product Level Control



Product Level Control manufactures our own line of treatment sensors, custom-equipped for optimal on-site performance. By offering flexible product designs with a wide range of available options, we meet your individual project goals for the best possible value.

FEATURES

Constructed to meet client specifications

Easily changed between Normally Open (NO) and Normally Closed (NC) — simply remove the E-clip and invert the float

Various materials of construction allow for chemical resistance to contaminants

Delivered fully assembled

1-year warranty

ELECTRICAL SPECIFICATIONS

- Maximum contact ratings:
 0.080 Amp, 120V, 60 Hz Resistive
 0.040 Amp, 240V, 60 Hz Resistive
 3.36 VA, 240V, 60 Hz Pilot Study
 1 Amp Max @ 24 VDC Resistive
- · Single pole, single throw switch (SPST)
- 18/2 stranded copper conductors

MECHANICAL SPECIFICATIONS

- Maximum pressure rating of 100 PSI @ 20°C
- Maximum temperature rating of 100°C
- Minimum specific gravity rating of 0.8□
- Operable at angles up to 30° from vertical
- Length equals 6.5'
- Diameter equals 0.5

PROCESS OF OPERATION

Operating as a verticallyorientated level switch, a single float unit is used with a total fluid system to detect the presence of liquid in a recovery well or tank. When liquid is present, the float rises. Simply secure the sensor in a well or tank by restraining the power cord.

PLC PERSONALIZED ORDERING NUMBER Cord Length 0-N/A 1-25 2-50 3-75 4-100' Float Type 6-Polypropylene 7-Acetal 9-PVDF SDXX-SF

CARBON PARTS LIST



File Name:

Parts List GWTT

Site Reference: Date: Generated by: ROCKAWAY NJ 11/24/2009 BGG

Reference	Qty		Description	Material	Part Number
VAPOR CARBON	2	each	TETRASOLV-VFD-85 CARBON VESSEL, VAPOR PHASE, UP FLOW SERIES, 300 LB VIRGIN CARBON, 8 INCHES OF WATER COLUMN PRESSURE DROP AT DESIGN FLOW OF 250 CFM, 6 PSI MAX, 250°F MAX, 2" FPT	STEEL	TETRASOLV-VFD- 85 WITH 300 LBS VIRGIN CARBON
. 100				·	

1



Liquid & Vapor Filtration Remedial • Industrial • Municipal

Operation & Maintenance Manual

VFD • VFV • VF • VR SERIES

Tetrasolv Filtration Vapor Filters

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1.0 GENERAL DESCRIPTION

The liquid series filters utilize fixed bed filtration to treat vapor. The filters employ a variety of medias to remove or catalyze contaminants. Flow through the filter may be either up flow or down flow depending upon the media supplied and the operation parameters. Generally inlet and outlet locations are indicated on the filter and or the filter drawings.

The most common application utilizes activated carbon as the adsorption media. Typically vapor which contains low levels of organic contaminants flows upward through the column of activated carbon where the larger organic molecules adhere to the porous structure of the activated carbon granules. This adsorption begins at the bottom of the "bed" and continues upward as the original adsorptive area becomes saturated.

Complete saturation of the carbon is dependent upon many factors such as contaminant levels, temperature, compounds being adsorbed, humidity, etc. Typically a carbon isotherm has been run on the influent stream to determine the expected rate of consumption of the activated carbon media. When monitoring has determined discharge air no longer meets discharge requirements the carbon will have to be removed and replaced (refer to section 5.0).

2.0 SAFETY CONSIDERATIONS

It is important that the entire O&M manual be read prior to set up and operation of the carbon system. If you have any questions please contact Tetrasolv Filtration at the number listed below or support@tetrasolv.com.

 WARNING: Where system pressure may exceed design pressure we strongly recommend the use of a relief device. Exceeding the maximum pressure of the filter could result in catastrophic failure of the vessel.

- Always adhere to "lockout/tagout" procedures when servicing the system.
- Wear appropriate safety equipment when operating system.
- ♦ WARNING: Wet or dry activated carbon preferentially removes oxygen from air. In closed or partially closed containers, oxygen depletion may reach hazardous levels. If workers must enter a container containing carbon, appropriate sampling and work procedures should be followed for potentially low-oxygen spaces - including all applicable federal and state requirements.
- WARNING: High concentrations of certain compounds such as BETX and low concentrations such as ketones, aldehydes, organic acids and sulphur may cause severe temperature rises.
- Understand the potential hazards of the stream being treated by the system. The activated carbon may contain higher concentrations of the contaminants being adsorbed than is in the influent stream. In addition the carbon may be considered hazardous material and therefore may require specific handling precautions unknown to Tetrasolv Filtration.

3.0 INSTALLATION

3.1 Shipment

Typically filters are shipped with media installed. However, in certain instances media is shipped to the site to be installed after installation. In very large systems it may be advisable to not install the media until adsorbers have been placed into final position and secured.

3.2 Unloading

Refer to the product data sheet for weight information for appropriate sizing information for the equipment to be used.

All components should be lifted either by crane or forklift as designated by the model.

 WARNING: Failure to follow the procedures outlined below can result in catastrophic damage to the system. Crane Lift - If a crane lift is to be used we recommend the following method. A "spreader" equaling 75% of the distance between the opposing lifting eyes on each adsorber should be used to insure proper lifting force direction. Attach an appropriately sized spreader beam and lifting cables to each lift eye of the component. The use of an experienced crane operator and quality equipment is highly recommended.

Fork-Lift - When using a forklift we recommend that the fork tubes on the filter be used or a pallet if the unit was shipped on a pallet.

3.3 Inspection

Perform the following inspections after un-loading the system. Note any discrepancies and contact TetraSolv immediately.

- Check the vessel exterior for damage which may have occurred during shipment. Inspect the support structures and piping support for damage.
- Inspect the piping system for damage. Insure the valves operate properly. Check installed instruments and instrument installation points for damage.
- If the filters are shipped without carbon visually inspect the interior of the vessel for damaged internals.
- Inspect the carbon discharge, drain and vent valves for damage

3.4 Set Up

The filter should be placed on a level concrete pad of appropriate thickness to support the system at it's maximum operational weight. The filter should be secured to the pad using appropriately sized anchor bolts.

Connect the site piping to the filter inlet and outlet connection points. It is important that all piping connected to the filter should be self supported. We also recommend in hard pipe installation that a flexible joint be used to further insulate the filter from vibration and stress.

Connect any gauges and instrumentation shipped

loose with the system.

The outlet piping if connected to a stack or vent should be designed to prevent the introduction of water or debris into the adsorber piping. Discharge piping should be sized equal to or greater than the diameter of the system piping or back pressure could occur creating excess pressure drop on the system.

Flowrates greater than 60 cfm / sq ft can produce bed fluidization in vapor phase filters. When this occurs carbon granules can be lifted and propelled out of the carbon bed in up-flow applications. In extreme cases large amounts of carbon can be expelled. If the system will be operating near or greater than the amount stated above please contact Tetrasoly for recommendations.

Carbon filters can be manifold in parallel operation for higher flowrates. Series operation is the preferred method of operation as it provides for the greatest degree of bed utilization.

Vapor conditions such as high humidity and high temperature (> 125° F) can cause inefficient adsorbtion to occur. If these conditions exist contact Tetrasolv for support. Also, any free water or product and debris should be eliminated with a knockout filter prior to the vapor stream entering the system. Many other vapor issues may effect Adsorber operation and we therefore recommend you discuss your specific installation with a representative.

4.0 OPERATION

4.1 Modes of Operation

With certain applications (2) filters in series flow are utilized. Listed below are typical operational modes.

- Shutdown Both filters completely off-line and isolated.
- Series Flow Influent enters primary filter and exits through secondary adsorber (this is the preferred method of operation)
- Isolation Flow Only one filter is receiving influent. This mode is typically used when the operator is maintaining the off-line filter.
- Parallel Flow Both filters are receiving the influent as the primary. Flow is split equally

between the filters. This mode is used when higher flow rates need to be achieved and contact times are not critical.

4.3 Monitoring

Adsorber units only require periodic monitoring if properly installed. The following items may be monitored:

Pressure: Check inlet and outlet pressure. Increase in pressure differential may indicate media breakdown or presence of high moisture. Rapid increase in pressure drop could indicate adsorber failure.

Samples: Inlet and outlet sample points if provided for vapor analysis to determine system performance.

5.0 ADSORBER SERVICING

The Adsorber may be serviced on-site using a vacuum removal method. Prior to servicing the unit should be closed off from influent and effluent lines and any electrical devices or connections should be tagged off.

After removal of the spent carbon is complete, it is recommended that the inside of the Adsorber be checked thoroughly and any minor maintenance conducted.

5.1 Carbon Loading - Bulk Bag

 WARNING - Dry activated carbon generates considerable dust. While activated carbon poses no health risk the dust can cause respiratory irritation and occasional skin rash. Therefore we recommended the use of proper clothing and dust mask during filling operation.

Hoist the bag over the manway and untie the outer bag exposing the inner chute. Untie the inner chute while clasping it shut. Remain holding the chute and carefully lower the chute into the manway. Un-clasp the chute and allow the carbon to discharge from the sack. The carbon should flow out very quickly and completely. When finished shake the bag and invert the chute into the bag.

If at any time you wish to stop the flow of carbon simply re-grasp the chute up high and cinch. Re-tie the bag.

5.2 Carbon Loading - Vacuum Method

manifold failure or leaking valves and gaskets.

In this method dry-activated carbon will be loaded into to the adsorbers using a vacuum rig. To add the carbon to the filters use the following method:

WARNING: Due to the low vacuum rating of the VF series adsorbers (< 60" H_2 0) only experienced change-out personnel should attempt this method of re-filling. Exceeding the recommend vacuum rating could lead to failure of the superstructure of the vessel.

- 1. Connect a 3" vacuum source to the auxiliary connection of the adsorber to be filled.
- 2. Install a 16" bolted transfer lid onto the manway opening of the adsorber to be filled.
- 3. Turn on the vacuum and check for good flow of air through the adsorber. Connect the fill line to the transfer lid and lead enough hose to reach the fresh carbon source (Note: This should be as short of a distance as possible).
- 4. Begin vacuuming carbon into the adsorber. It is important to note that the loading method is actually conveying and not true vacuum. The hose should contain 1/3 air with the carbon. Closely view the adsorber being filled. If the adsorber is collasping in excessively take less carbon and more air. This is something from experience and cannot be adequately explained here.
- 5. When transfer is complete the transfer lid should be removed and the carbon in the adsorber should be leveled out to insure even pressure drop across the bed.
- 6. Close the manway and turn the adsorber back on.

Note: When the system if first started up small amounts of fines may be present in the discharge stream. This is normal and should discontinue within a short period of time.

6.0 MAINTENANCE

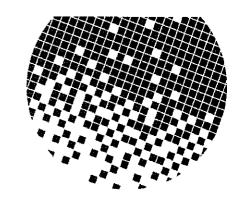
6.1 Extended Shutdown

If the system is to be shutdown for extended period of time it is recommended that the valve be placed in shutdown mode and the system water drain valve be left open.

Monitor the system closely after extended shutdown for signs of potential problems such as interior



HOME OFFICE 1424 Abraham Drive Anderson, IN 46013 765-643-3941 Phone www.tetrasolv.com



Warranty:

- All references to the Customer shall mean the Purchaser or the Lessee as applicable.
- (a) Tetrasolv warrants that any equipment which it manufactures will be free from substantial defects in material and workmanship for a period of six (18) Months from the date such goods are delivered to a carrier by Tetrasolv for shipment to the Purchaser.
- (b) The Purchaser agrees that the liability of Tetrasolv hereunder shall be limited to replacing, repairing or issuing credit for, at Tetrasolv's discretion, any equipment which is returned F.O.B. Tetrasolv's plant within the applicable term of the warranty, provided that (i) upon examination of the equipment Tetrasolv determines that the alleged defect constitutes a substantial defect, and (ii) the warranty made herein is not invalid pursuant to Section (d) hereof. The Purchaser agrees that such replacement, repair or credit shall be its sole and exclusive remedies hereunder. For purposes hereof, a substantial defect shall mean any defect which prevents the equipment from operating in accordance with Tetrasolv's published specifications. In the event that Tetrasolv determines that equipment which is no longer manufactured by it contains a substantial defect and the warranty covering the defective equipment is not invalid pursuant to Section (d) hereof, the purchaser's sole and exclusive remedy hereunder shall be the repair of such equipment or the replacement of such equipment with new equipment at Tetrasolv's discretion. In no case is equipment to be returned by the Purchaser without first submitting a warranty claim in writing to Tetrasolv and obtaining a return authorization number from Tetrasolv. Equipment which is repaired or replaced pursuant to this warranty shall continue to be warranted for the unexpired portion of the warranty term applicable to the equipment so repaired or replaced, Tetrasolv shall make the final determination as to the existence or cause of any alleged defect.
- (c) The foregoing warranty shall not be valid (i) if the alleged defect is the result of abuse, misuse, accident, alteration, neglect or unauthorized repair; (ii) the equipment is otherwise installed improperly; (iii) Any repair shall be deemed unauthorized unless it is made (i) by Tetrasolv or a duly authorized agent of Tetrasolv or (ii) with the written consent or Tetrasolv.

- (d) The operating efficiency of treatment, abatement, and recovery equipment and systems is affected by factors extrinsic to their manufacture, including operating environment and such conditions of use as contaminant and related substance build-up, the frequency and type of operator maintenance and other external variables. For these reasons, specific levels of performance cannot be guaranteed for such equipment and systems.
- (e) THIS WARRANTY IS THE SOLE WARRANTY MADE BY Tetrasolv TO THE Purchaser AND IS IN LIEU OF ALL OTHER WARRANTIES OR OBLIGATIONS, EXPRESS OR IMPLIED. Tetrasolv EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.
- (f) THE Purchaser AGREES THAT IN NO EVENT SHALL Tetrasolv BE LIABLE FOR SPECIAL, INCIDENTAL, INDIRECT, EXEMPLARY OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF PROFITS OF LOSS OF USE OR ANY OTHER ECONOMIC LOSS, WHETHER BASED ON CONTRACT, TORT OR ANY OTHER LEGAL THEORY.
- (g) THE REMEDIES PROVIDED HEREIN ARE Purchaser'S SOLE AND EXCLUSIVE REMEDIES.

Appendix H—Photos











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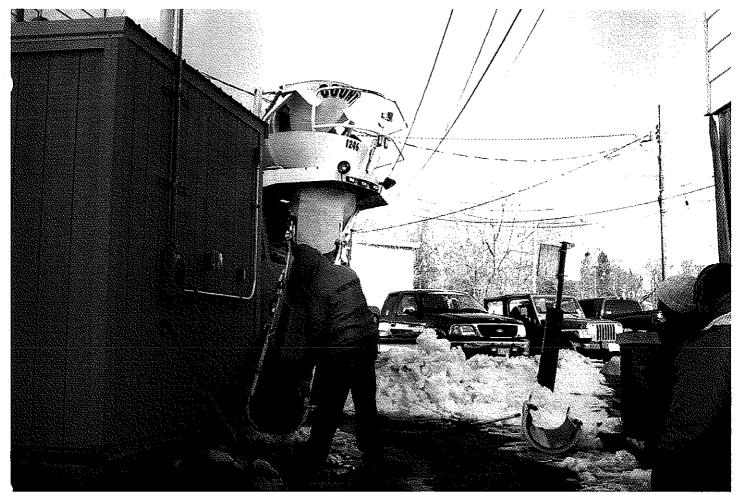




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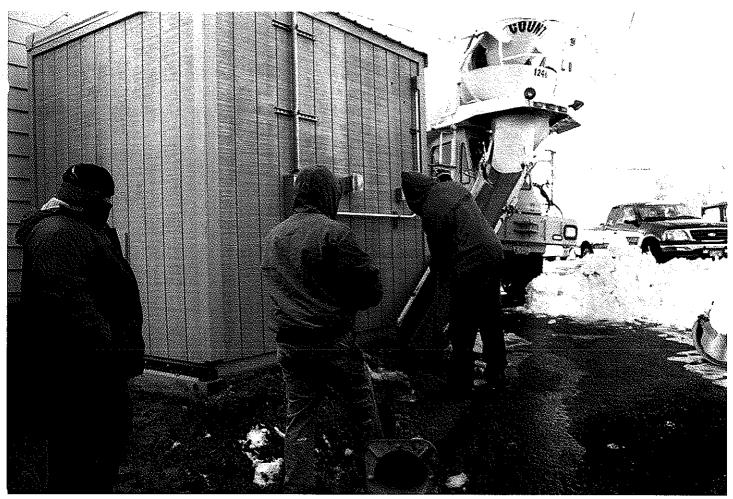


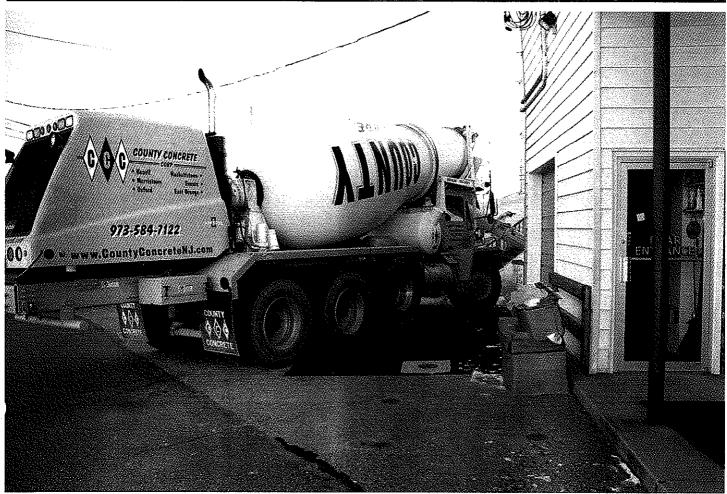








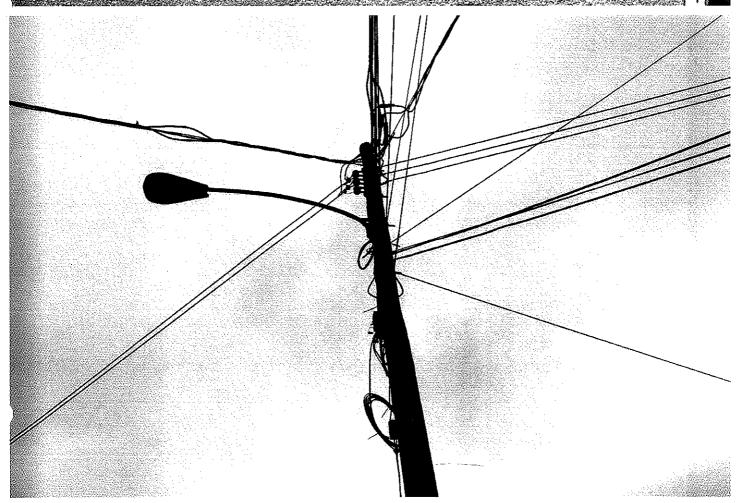


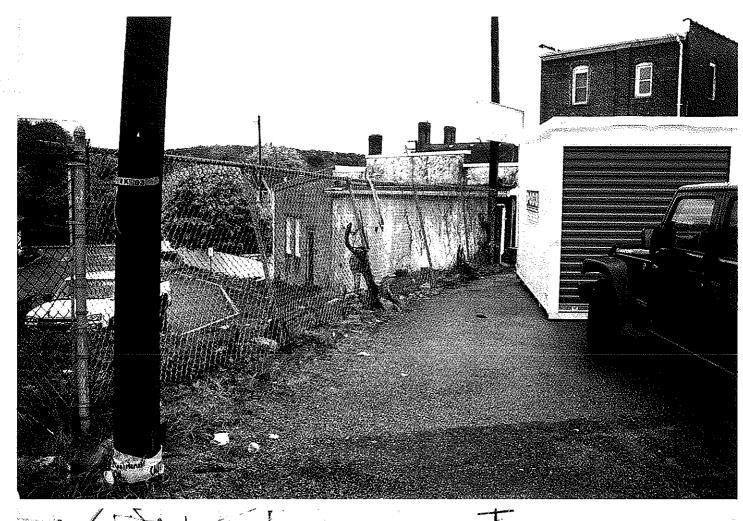






























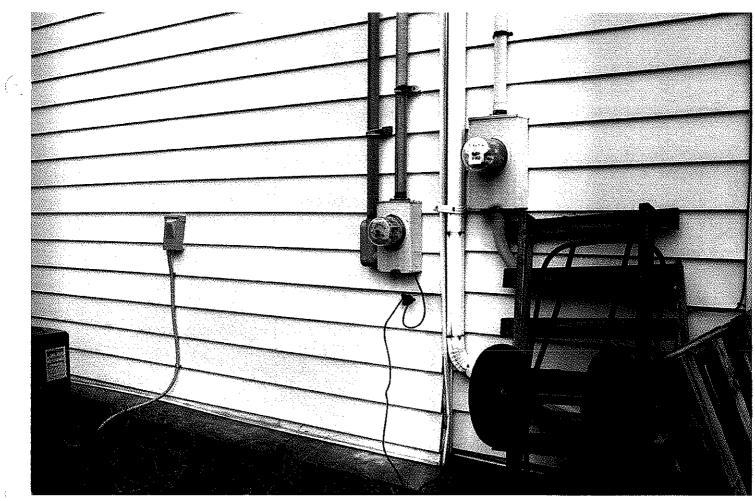


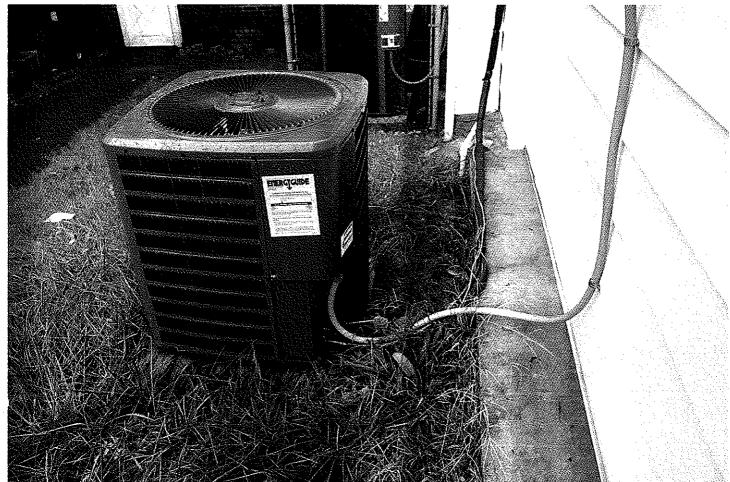


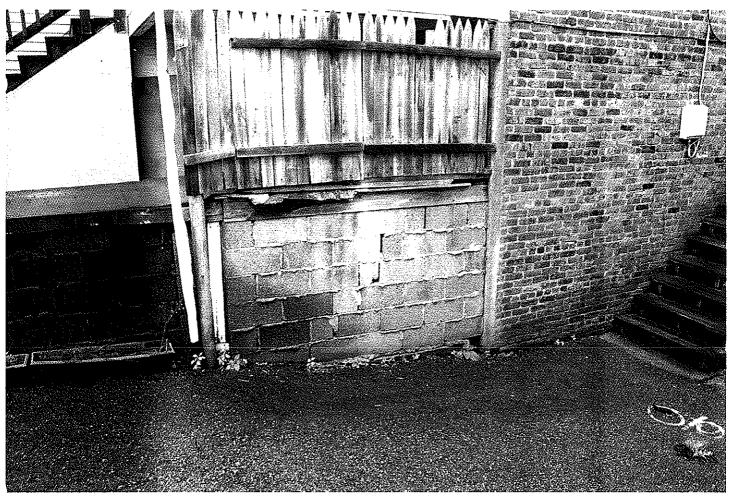


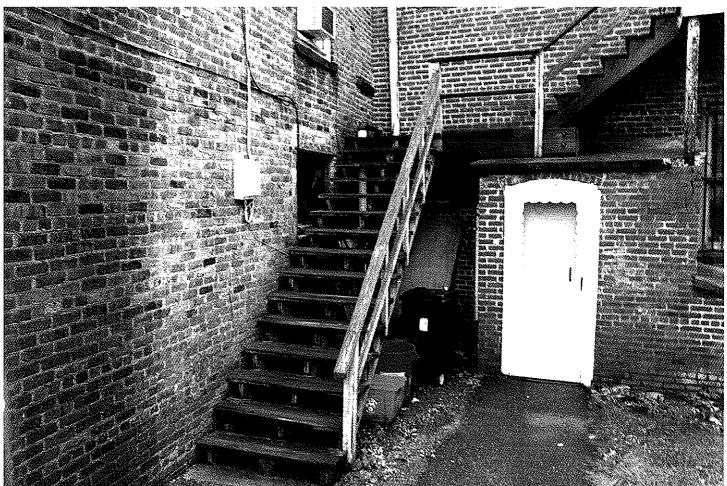


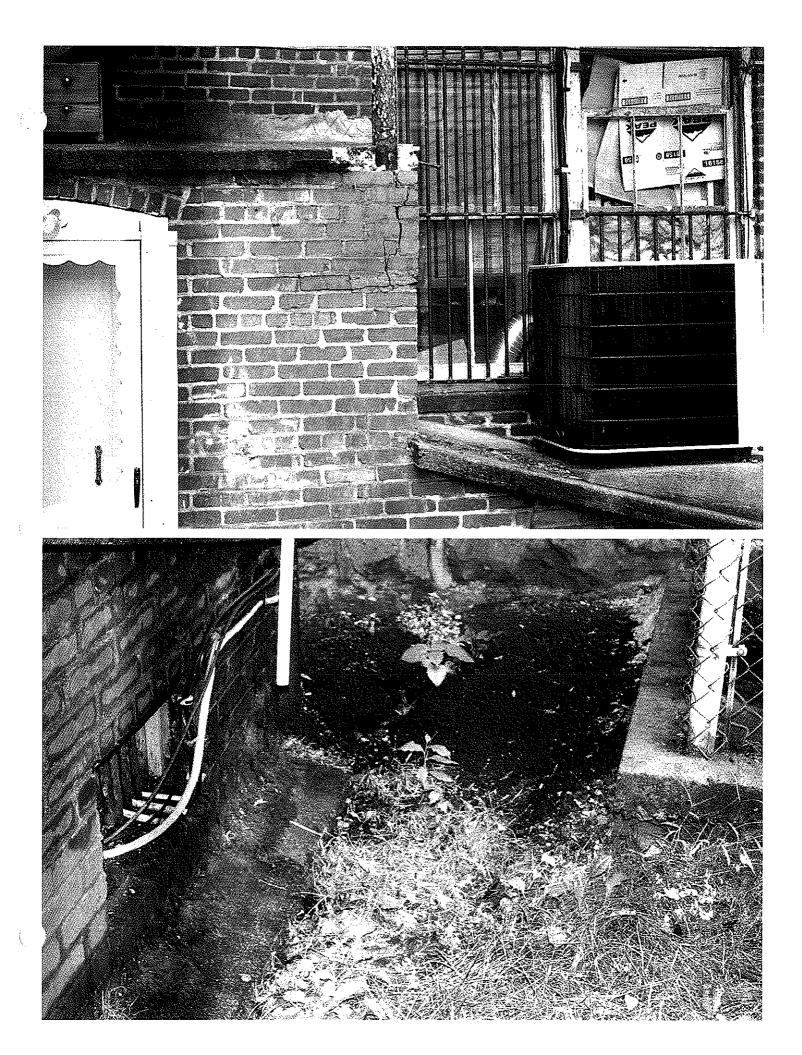




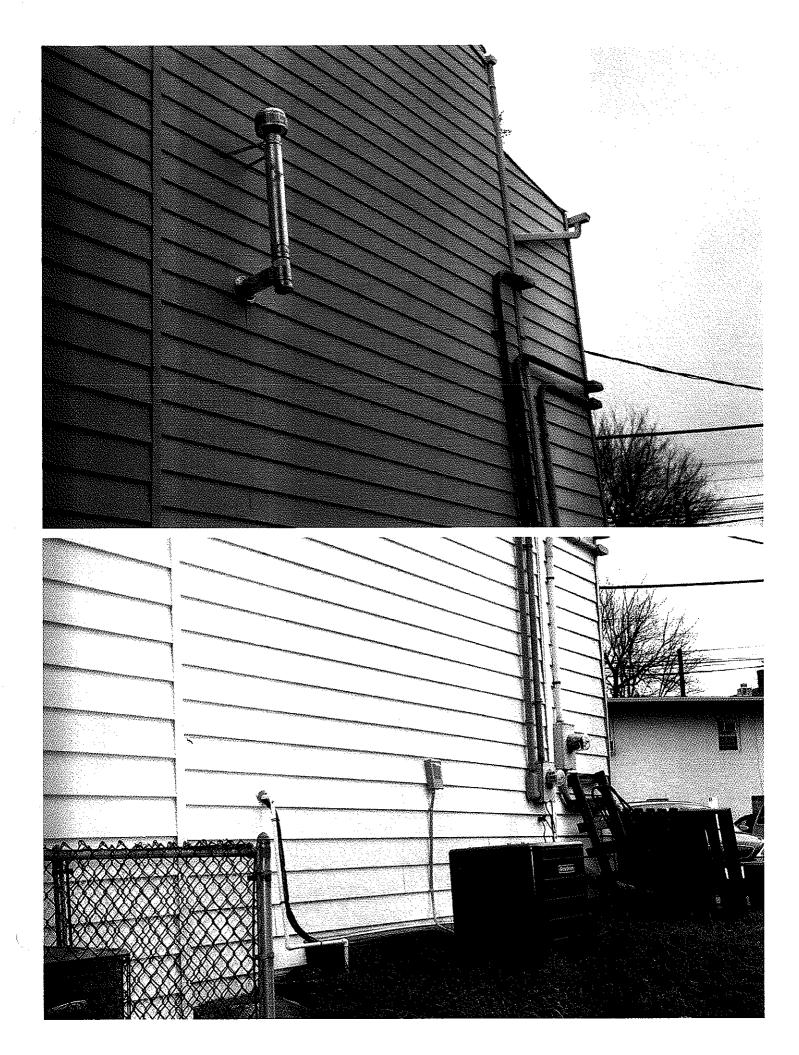


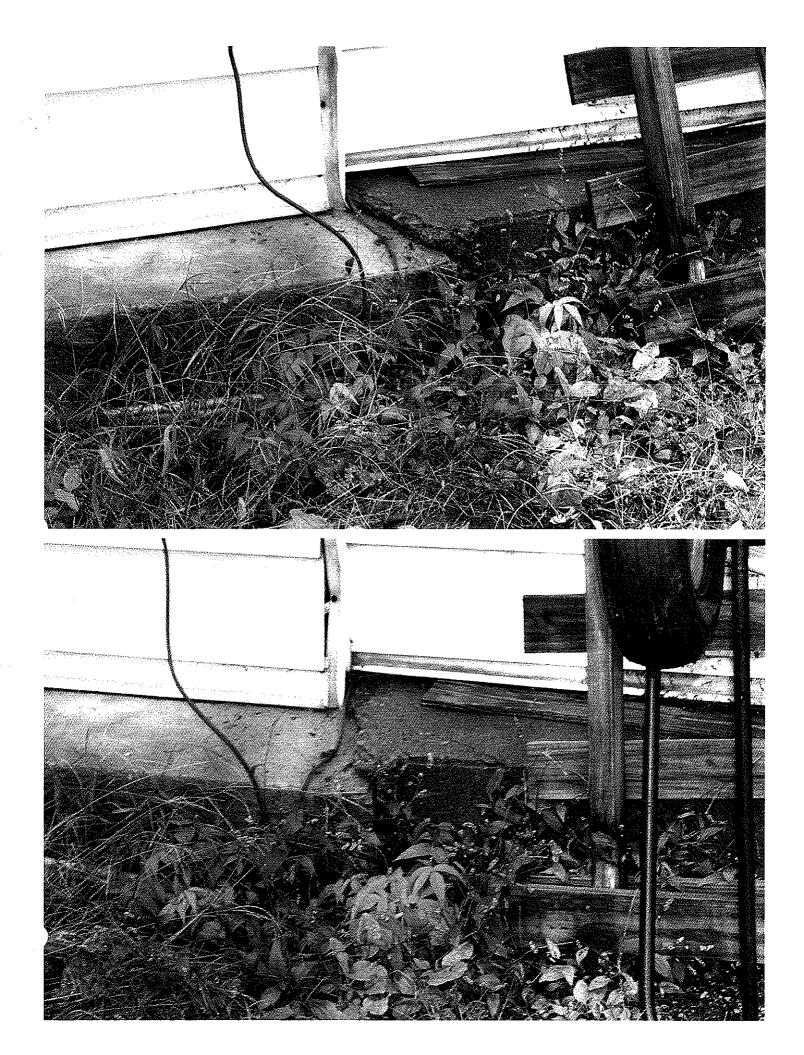






















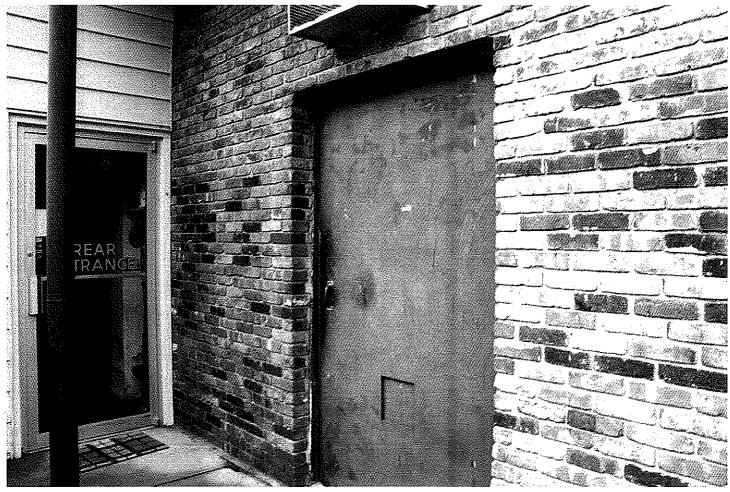


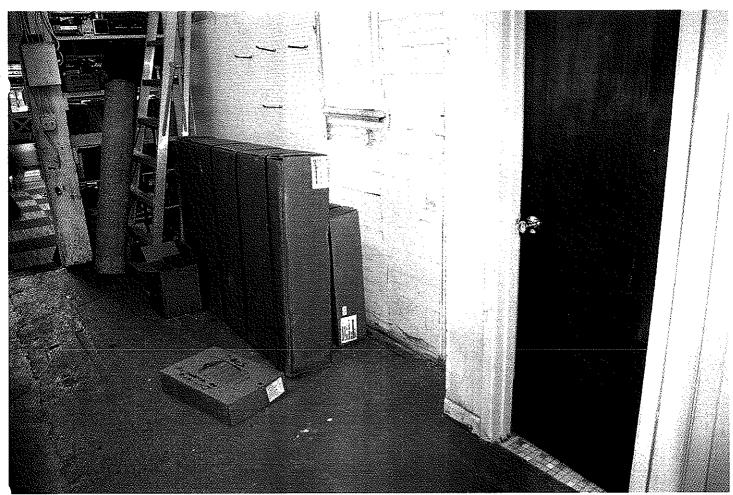


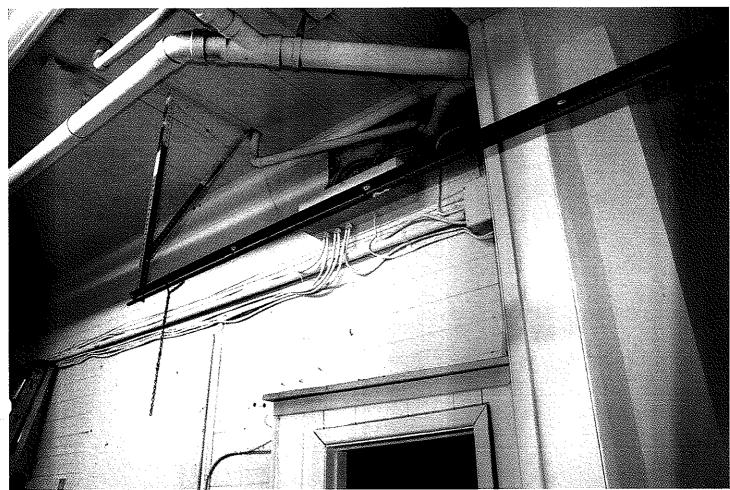


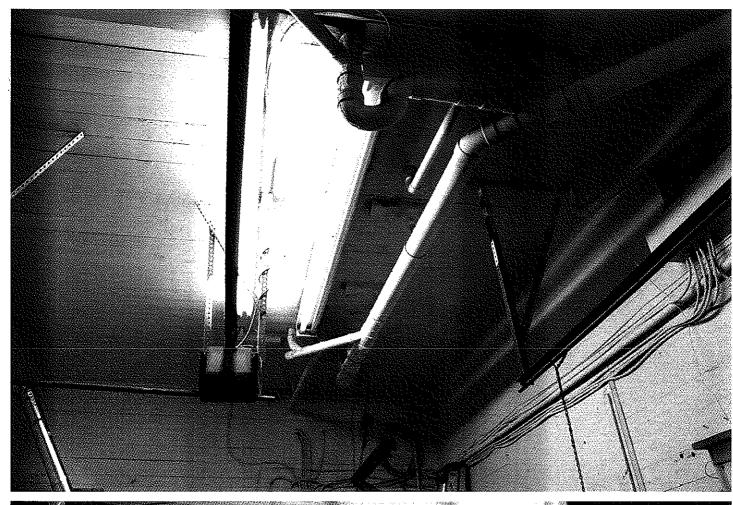




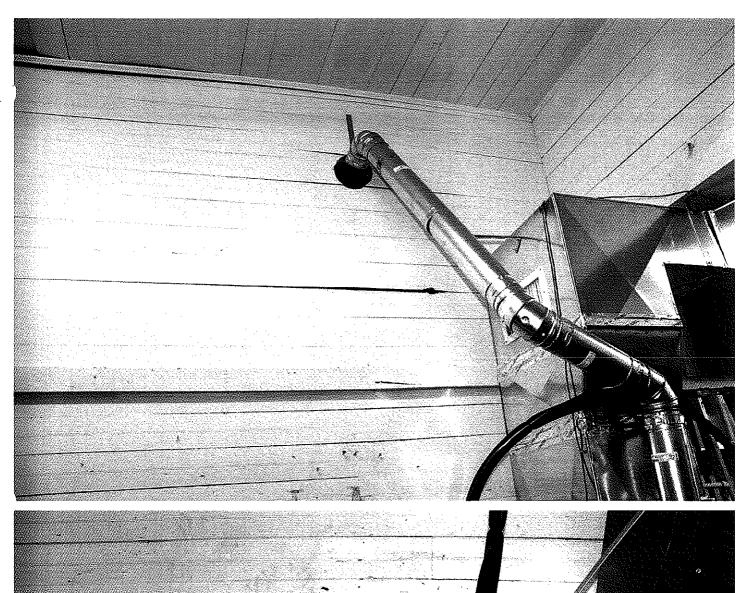










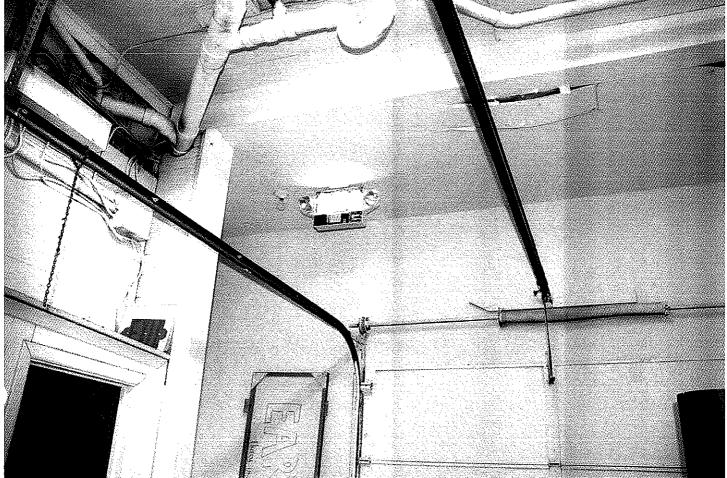








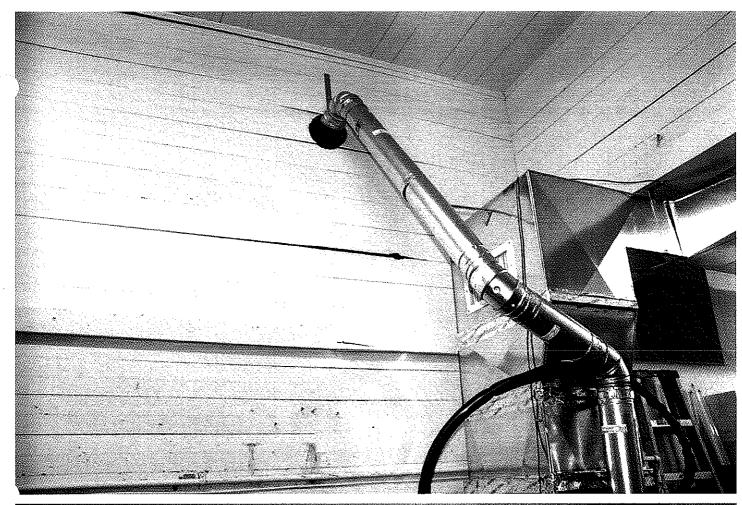




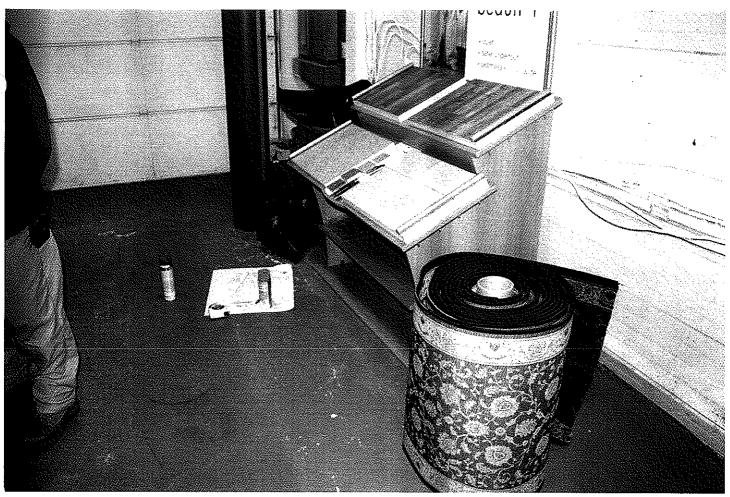


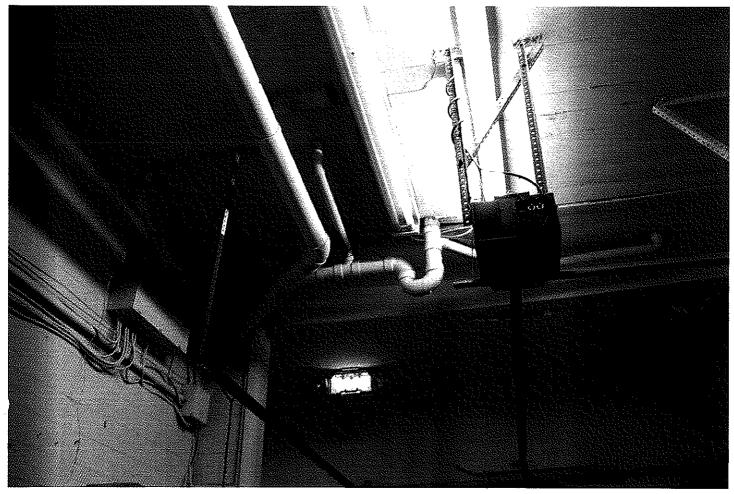


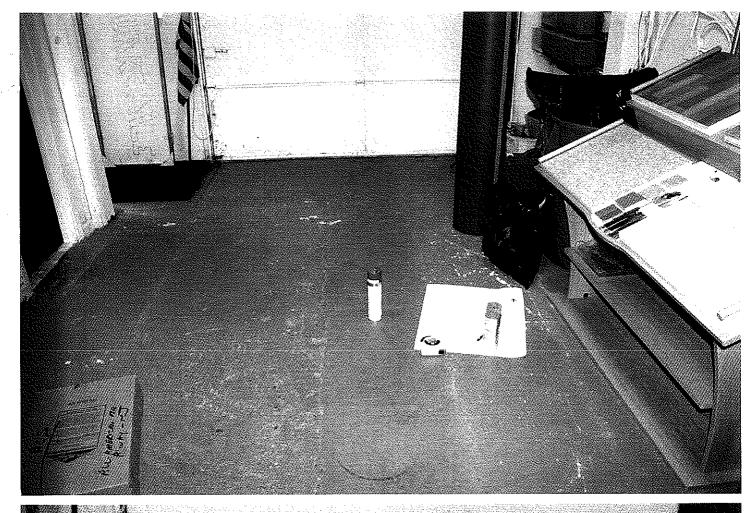




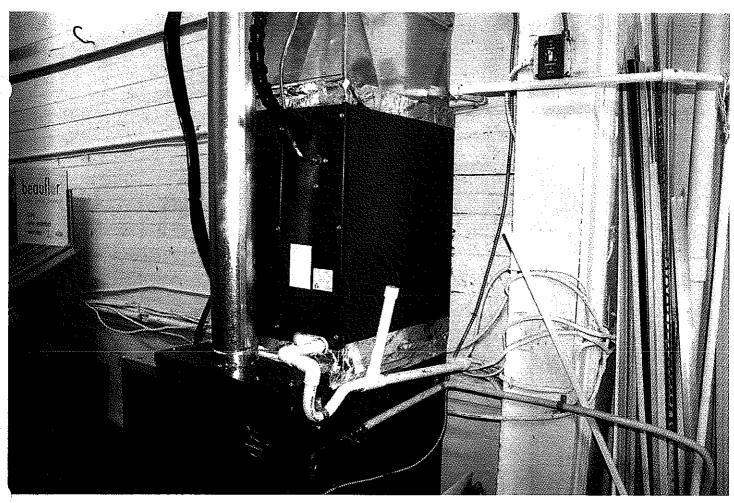


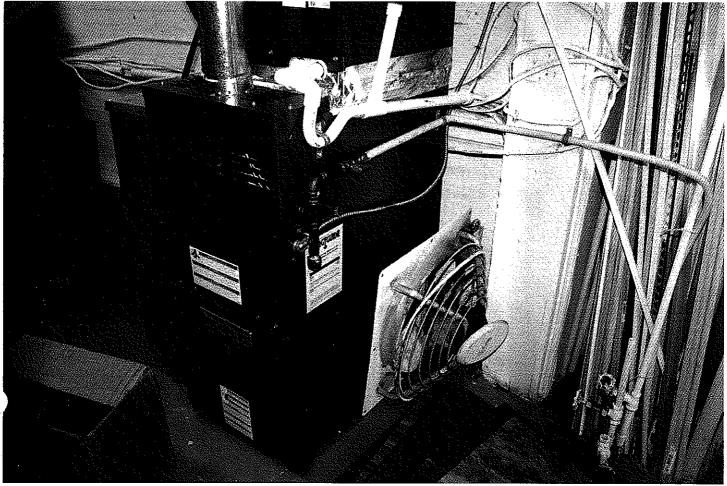


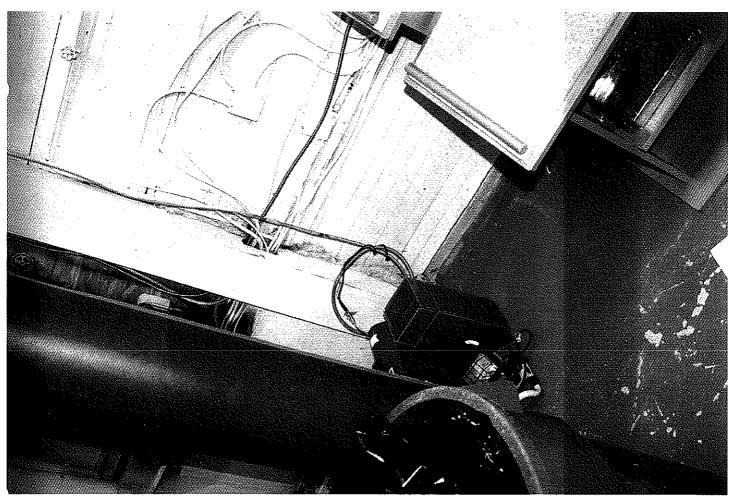


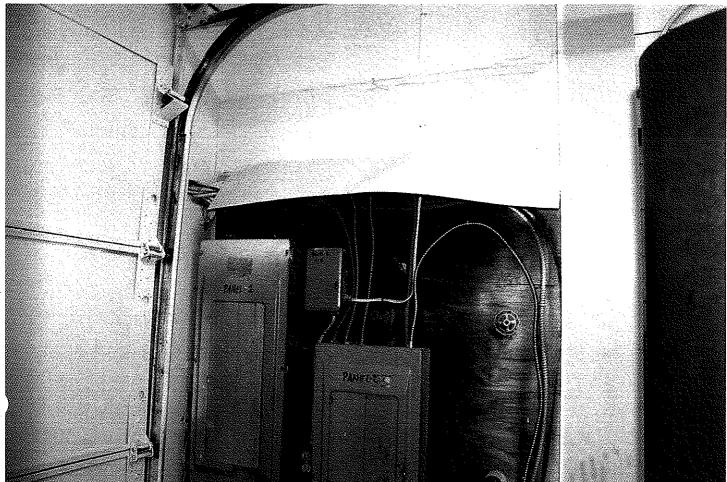














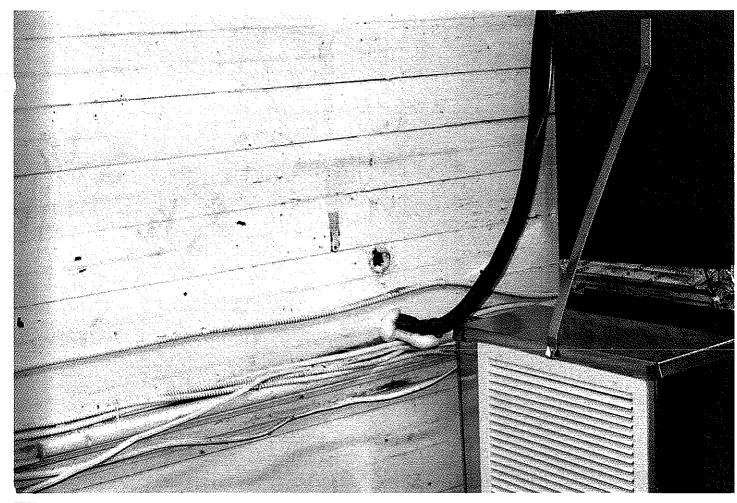


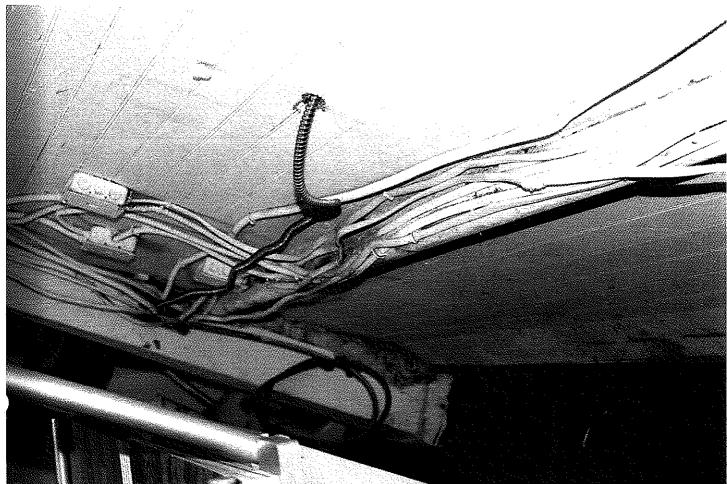


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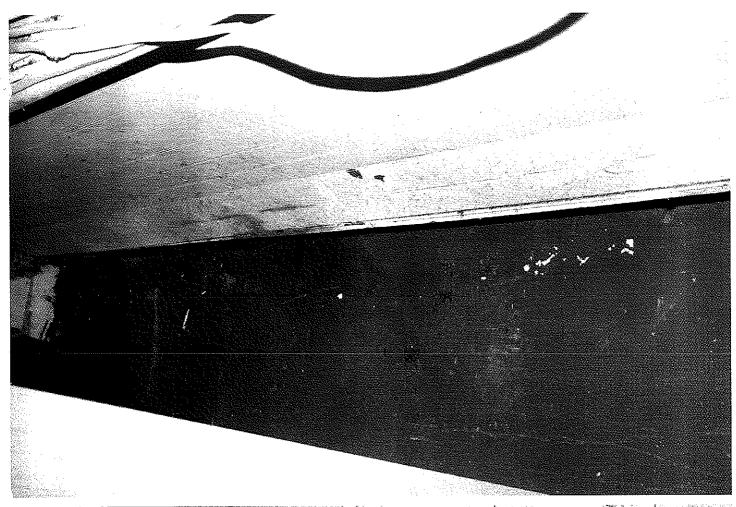
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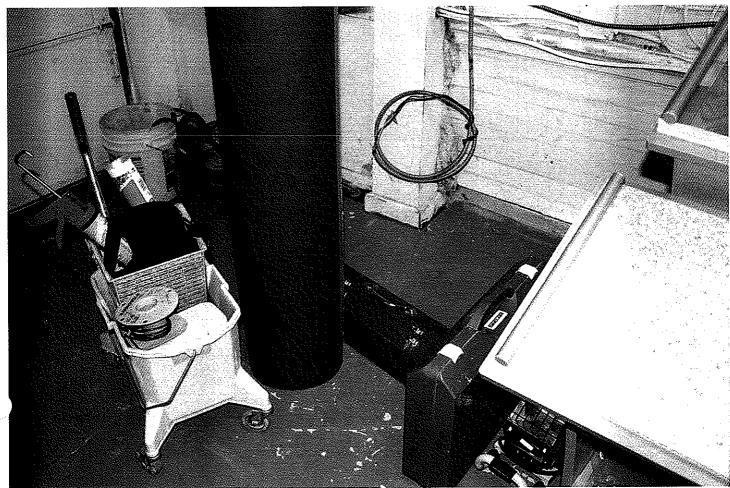


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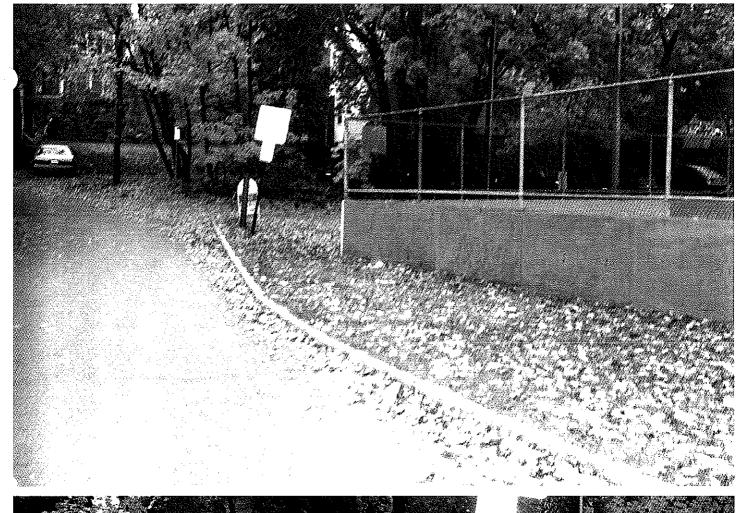


















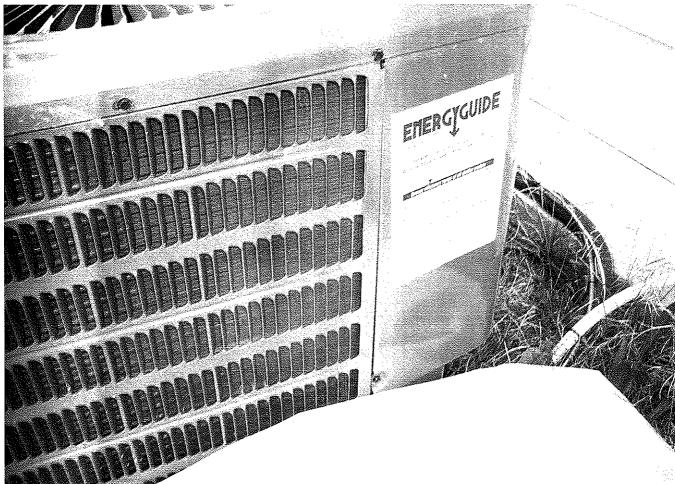




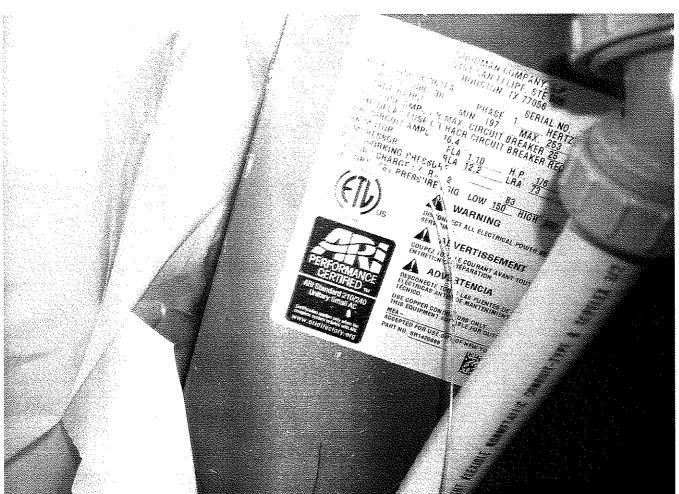


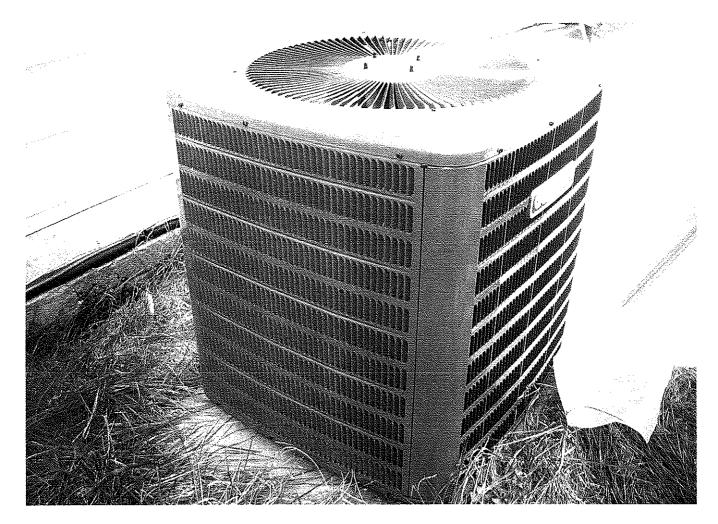




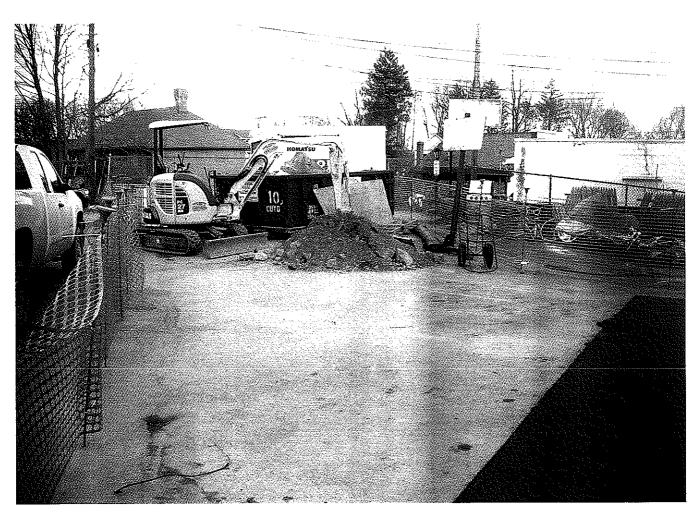




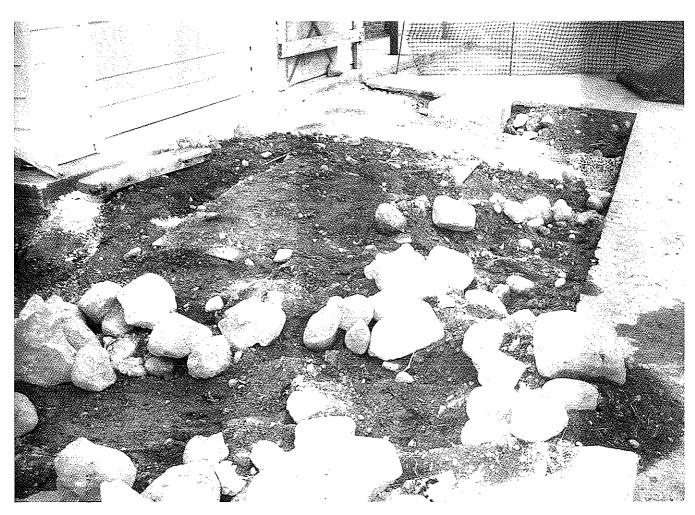








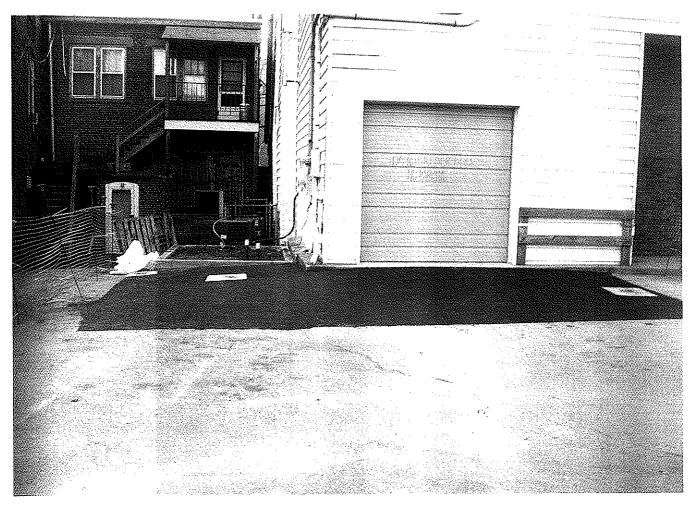






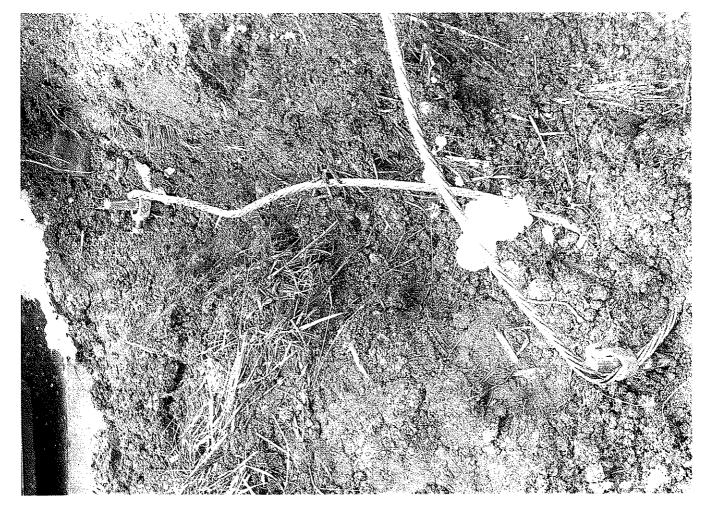


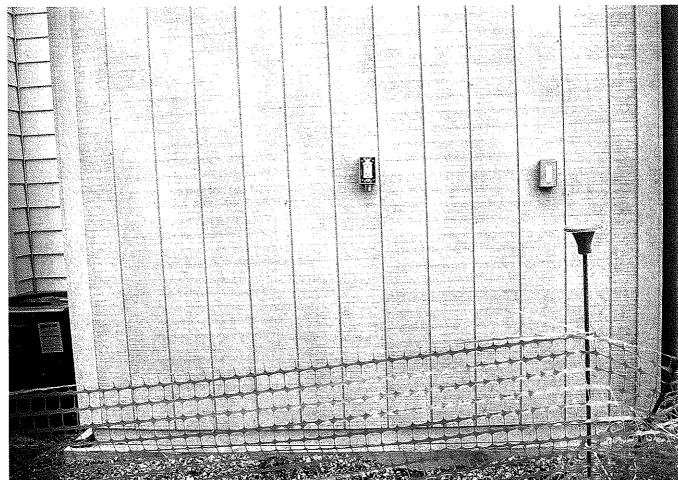




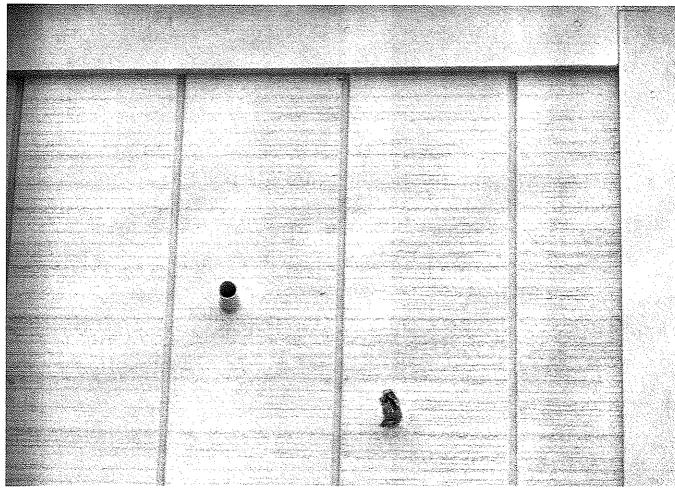


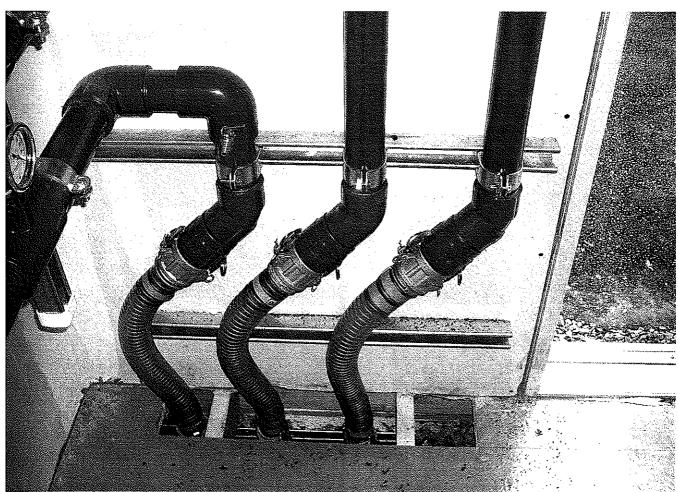






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Appendix B

Field Forms





Los Alamos Technical Associates, Inc. 756 Park Meadow Road Westerville, OH 43081

Rockaway	OU-4 SVE SYSTEM
Field Data	Reading Sheet

Site Name	Rockaway	OU-4 Sampled By:		_
Project Number:				
Date: Weather:				
vv cattlet.				
Instrument Identification				
W 1 W 11		PID		Other
Make/Model	Cal info			
	· I			
System Deadings				
System Readings				
Post knockout Air flow Reading		CFM		
Post Knockout Vacuum				
Knockout Tank Sight Glass		Yes No Liquid Present		
Pre Carbon Pressure				
Pre Carbon Temperature		o _F		
Intermediate Carbon Pressure				
Post Carbon Pressure Blower Run Hours		Hours		
Alarms Present (described below i	f Yes)	Yes No		
Wellhead Readings				
Wells	Flow Rate (CFM	Vacuum " of H20	PID reading (ppm)	Water Level
VE-1	(==11=	, acumi Villav	reading (ppin)	,, attr zicrei
VE-2				
Lateral Collector	l			1
LC-1				
- -	ı		1	ı
Maintenance Activities/Checks		_		
Dilution Air Filter Check		Yes No		
Knockout Tank		res No		
Ventilation fan		☐ Yes No		
Autodialer Check		Yes No		
Ruilding Issues				
Building Issues				
Wellhead Issues				
Complet/Volume - C-II4-3		C1- C. P. 4 3	@	
Samples/Volumes Collected		Sample Collected	<u> </u>	-
Parameter		# and Volume	Туре	
			Summa	
		-		-
				<u> </u>
			Page	of

Rockaway Borough Main/Wall St. Superfund Site Quality Control Plan Rev. 0

Daily Quality Control Report

Date:			Re	ро	rt No.						
Project:			Day:	Su		М	Т	W	Th	F	Sa
Project no.:			Weather	: Cle	ear	Clo	udy	Over	cast	Rair	n Snow
Project Manager:			Temp. (°F)	To 32		32 50		50° -	70°	70° 85°	
Quality Control Insp	ector:		Wind:	St	ill	Mode	erate	Hiç	gh		<u> </u>
			Humidity	/: Dr	ry	Mode	erate	Hiç	gh		
Personnel onsite:			l								
Name	Title	Orgai	nization	Conta	ct		Tir	me In		Time Out	Hrs Onsite
Sampling equipment	on site:										
Work performed:											

Sheet __1__ of __2__

Rockaway Borough Main/Wall St. Superfund Site Quality Control Plan Rev. 0

Daily Quality Control Report (continued)

Project:	Report no.:
Project no.:	Date:
Quality control activities (including field calibration	ns):
Health and safety levels and activities:	
· · · · · · · · · · · · · · · · · · ·	
Problems encountered/corrective actions taken:	
Special notes:	
•	
Tomorrow's expectations:	
Chart 0 of 0	
Sheet <u>2</u> of <u>2</u>	
By:	e:
1160	

Appendix C Air Permit Application



New Jersey Department of Environmental Protection Reason for Application

Permit Being Modified

Number:0 **Permit Class:**

Description

Permit is being submitted to begin operation of a pre-existing Soil Vapor Extraction unit of Modifications: installed under authority of the United States Environmental Protection Agency as part of the Rockaway Wellfield Superfund Site, Operational Unit 4 (OU-4). The soil vapor extraction unit has been designed to address residual PCE contamination associated with historic dry-cleaning operations present underneath the 2 Wall Street structure.

Date: 12/22/201

Date: 12/22/2010

New Jersey Department of Environmental Protection Facility Profile (General)

Facility Name (AIMS): Rockaway OU-4 Facility ID (AIMS): 26812

Street 2 WALL ST

Address: ROCKAWAY, NJ 07866-2904

Mailing BRIAN QUINN Address: USEPA

290 BROADWAY 19TH FLR NEW YORK, NY 10007-1866

County: Morris

Location Plume located beneath building and in north **Description:** parking area. Remediation equipment located

in 8' wide x 9.25' long x 8' high shed located adjacent to 2 Wall street building in the north

parking area.

State Plane Coordinates:

X-Coordinate: 753,299 **Y-Coordinate:** 488,386

Units: New Jersey State Plane §

Datum: NAD83

Source Org.:

Source Type: Approx. Addr. Match

Industry:

Primary SIC:

Secondary SIC:

NAICS: 562910

Type:

Email: quinn.brian@epa.gov

Date: 2/18/2011

New Jersey Department of Environmental Protection Facility Profile (General)

Contact Type: Consultant Organization: Los Alamos Technical Associated, Inc. (LATA) Org. Type: Corporation Name: Shannon Lloyd NJ EIN: Title: Project Manager **Phone:** (614) 508-1200 x Mailing 756 Park Meadow Drive Address: Westerville, OH 43081 **Fax:** (614) 508-1200 x **Other:** (614) 207-5402 x Type: Email: slloyd@lata.com **Contact Type: Owner (Current Primary) Organization:** US Environmental Protection Agency Org. Type: Federal Name: Brian Quinn NJ EIN: **Title:** USEPA Regional Manager **Phone:** (212) 637-4381 x Mailing 290 Broadway **Address:** 19th Floor **Fax:** () - x New York, NY 10007 **Other:** () - x

New Jersey Department of Environmental Protection Facility Profile (Permitting)

Date: 12/22/2010

1. Is this facility classified as a small business by the USEPA?	No
2. Is this facility subject to N.J.A.C. 7:27-22?	No
3. Are you voluntarily subjecting this facility to the requirements of Subchapter 22?	No
4. Has a copy of this application been sent to the USEPA?	Yes
5. If not, has the EPA waived the requirement?	
6. Are you claiming any portion of this application to be confidential?	No
7. Is the facility an existing major facility?	No
8. Have you submitted a netting analysis?	No
9. Are emissions of any pollutant above the SOTA threshold?	No
10. Have you submitted a SOTA analysis?	Yes
11. If you answered "Yes" to Question 9 and "No" to Question 10, explain why a SOTA analysis was not required	

12. Have you provided, or are you planning to provide air contaminant modeling?

Air Contaminant(s)				
Name	CAS Number			
Tetrachloroethylene	00127-18-4			

Rockaway OU-4 (26812)

New Jersey Department of Environmental Protection Equipment Inventory

Equip. NJID	Facility's Designation	Equipment Description	Equipment Type	Certificate Number	Install Date	Grand- Fathered		Equip. Set ID
E1	Blower 1	127 SCFM Regenerative Blower	Soil Venting Equipment		12/10/2009	No	12/10/2009	

000000 E1 (Soil Venting Equipment) Print Date: 12/22/2010

Make:	
Manufacturer:	Republic Blowers
Model:	HRB301
	Direct Drive, Sound Level 75 Db, 2 HP Motor 110/230/60, TEFC

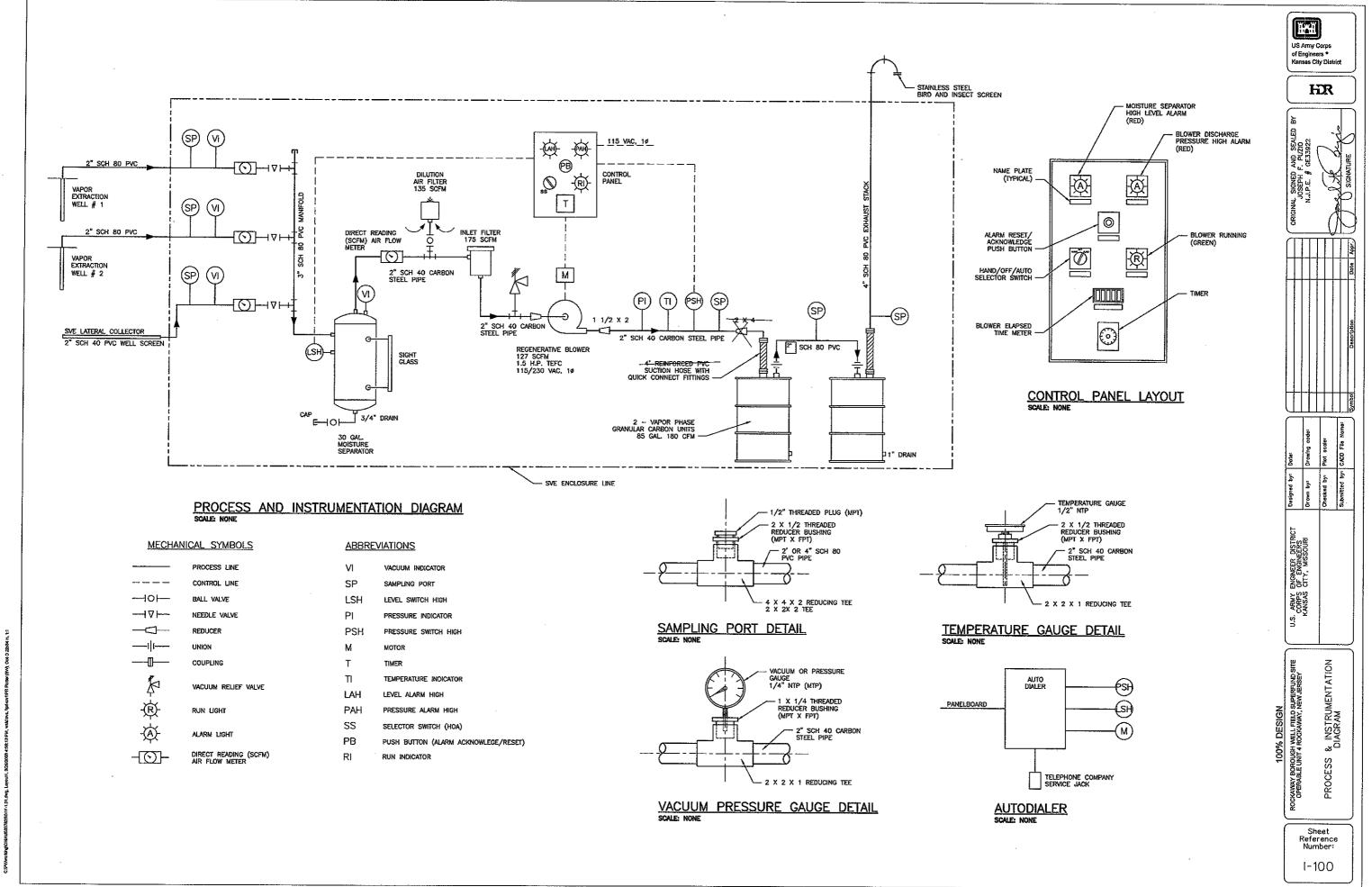
Have you attached a diagram showing the location and/or the configuration of this equipment?

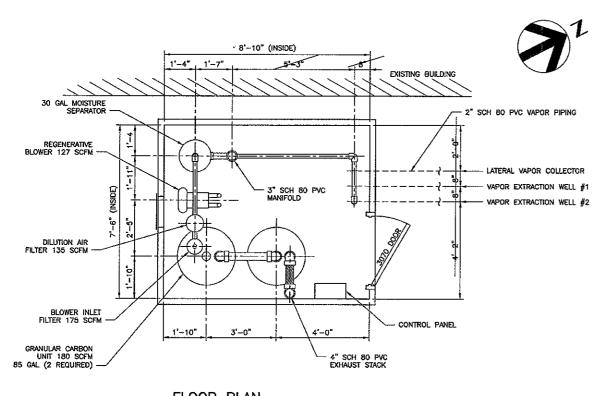


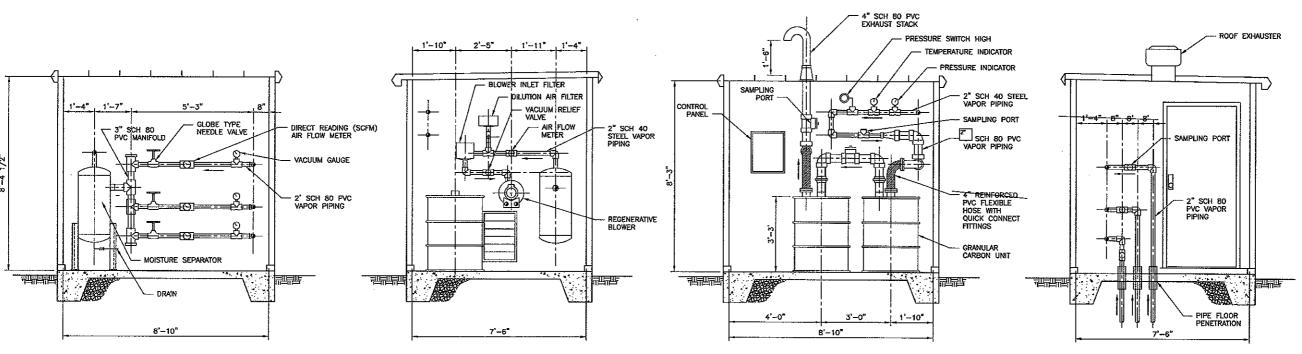
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?



Comments:







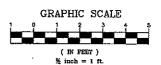
FLOOR PLAN
SCALE: 1/2" = 1'-0"

FLEVATION @ WEST WALL SCALE: 1/2" = 1'-0"

ELEVATION @ SOUTH WALL SCALE: 1/2" = 1'-0"

ELEVATION @ EAST WALL SCALE: 1/2" = 1'-0"

ELEVATION @ NORTH WALL SCALE: 1/2" = 1'-0"



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								Description
								Symbol
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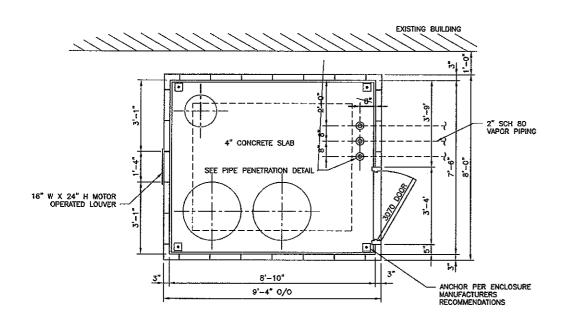
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Designed by: Date:	Drawn by:	Checked by:	Submitted by:
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS	KANSAS CITY, MISSOURI		

100% DESIGN
DOKAWAY BOROUGH WELL FIELD SUPERFUND SITE
OPERABLE LINIT 4 ROCKAWAY, NEW JERSEY
SVE EQUIPMENT ENCLOSURE
MECHANICAL PLAN AND
ELEVATIONS

Sheet Reference Number:

Reference Number:





CAULK ALL AROUND

SLIP RESISTANT EPOXY
RESIN FLOOR COATING

WWF 6X6-W10 X W10

COMPACTED 3/4"

CRUSHED STONE

WALL PANEL

BASE FLASHING

3 X 4 X 1/4 TUBE
SET ON 2 ROWS OF
CAULKING ALL AROUND

GRADE

COMPACTED 3/4"

CRUSHED STONE

WALL PANEL

BASE FLASHING

GRADE

4 1/2"

1'-0"

WALL PANEL

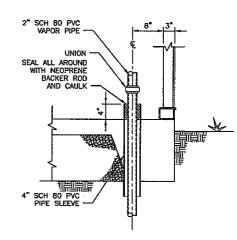
BASE FLASHING

4 X 1/4 TUBE
SET ON 2 ROWS OF
CAULKING ALL AROUND

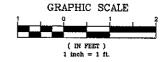
ALL AROUND

ALL AROUND

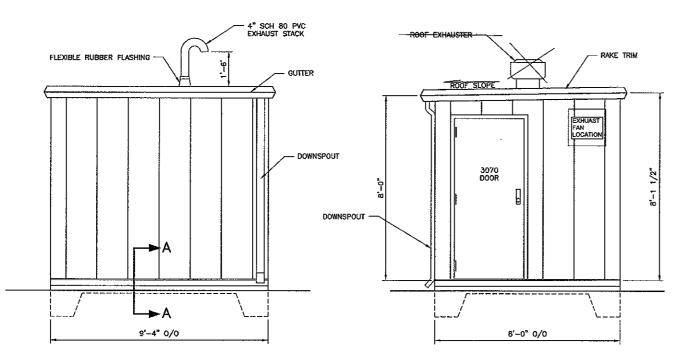
SECTION A-A



PIPE PENETRATION DETAIL SCALE: 1" = 1"-0"

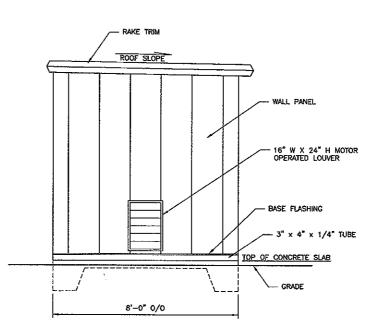


FLOOR PLAN SCALE: 1/2" = 1'-0"

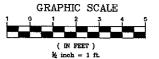


EAST ELEVATION SCALE: 1/2" = 1'-0"

NORTH ELEVATION
SCALE: 1/2" = 1'-0"



SOUTH ELEVATION SCALE: 1/2" = 1'-0"



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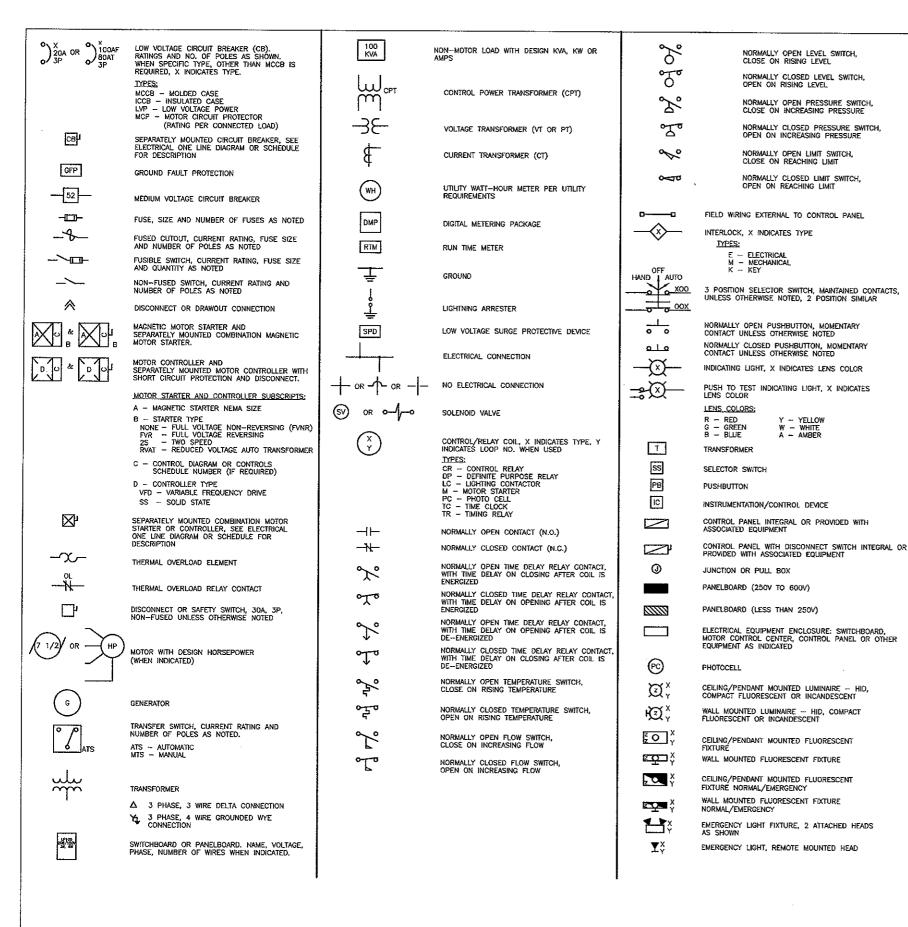
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Designed byr Dates	Drawn by:	Checked bys Plot scales	Submitted by:
 U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS	KANSAS CITY, MISSOURI		

NOW DESIGN
KAWAY BOROUGH WELL FIELD SUPERFUND SITE
OPERABLE UNIT 4 ROCKAWAY, NEW JERSEY
SVE, EQUIPMENT, ENCLOSURE

Sheet Reference Number:

A-100



⊕ [×] ⊚ [×]	DOUBLE FACED CEILING OR WALL MOUNTED EXIT LIGHT, DIRECTIONAL ARROWS (IF REQUIRED) AS INDICATED ON PLANS
⊘	SINGLE FACED CEILING OR WALL MOUNTED EXIT LIGHT, DIRECTIONAL ARROWS (IF REQUIRED) AS INDICATED ON PLANS
•-α _x	AREA OR ROADWAY LIGHT - POLE MOUNTED
~ĭ	LIGHTING FIXTURE SUBSCRIPTS;
	X - INDICATES FIXTURE TYPE PER LIGHTING
	FIXTURE SCHEDULE Y INDICATES CIRCUIT NUMBER FROM PANELBOARD z INDICATES CONTROLLING SWITCH (IF REQUIRED)
\$x	TOGGLE SWITCH
Ψ.Χ	SUBSCRIPTS;
	X INDICATES TYPE NONE NONE SINGLE BOLE
	NONE NONE — SINGLE POLE 3 — THREE-WAY 4 — FOUR-WAY
	HP — TOGGLE SWITCH, HORSEPOWER RATED K — KEY SWITCH
	TE - MANUAL MOTOR STARTER WITH THERMAL ELEMENT P PILOT LIGHT
	L LIGHTED HANDLE
	Y ~ INDICATES CONTROLLING SWITCH (IF REQUIRED)
H ()	SPECIAL PURPOSE RECEPTACLE AS DEFINED ON PLANS
	PLUG-IN RECEPTACLE STRIP, QUANTITY AND SPACING OF RECEPTACLES AS NOTED OR SPECIFIED
! ₹	TELECOMMUNICATIONS OUTLET JUNCTION BOX
⊯ _Y ∽x	QUAD-DUPLEX RECEPTACLE, TWO NEMA 5-20R UNDER COMMON COVER PLATE.
⇔ Ŷ	DUPLEX RECEPTACLE, NEMA 5-20R
ЮΫ	SIMPLEX RECEPTACLE, NEMA 5-20R
	SUBSCRIPTS: X - INDICATES TYPE
	GFCI GROUND FAULT CIRCUIT INTERRUPTER Y INDICATES CIRCUIT NUMBER FROM PANELBOARD
	CONDUIT TURNING UP
	CONDUIT TURNING DOWN
	HOME RUN TO PANEL, 2 #12, 1 #12G IN 3/4°C UNLESS OTHERWISE NOTED
	CIRCUIT RUN BETWEEN DEVICES EXPOSED IN
	NON-ARCHITECTURALLY FINISHED AREAS, CONCEALED IN ARCHITECTURALLY FINISHED
	AREAS, CONDUIT AND CONDUCTOR SIZES SHALL BE THE SAME AS THE HOMERUN FOR THE
	CIRCUIT
	CONDUIT RUN BETWEEN DEVICES CONCEALED IN NON-ARCHITECTURALLY FINISHED AREAS OR
	UNDER FLOOR SLAB. CONDUIT AND CONDUCTOR SIZES SHALL BE THE SAME AS THE HOMERUN
	FOR THE CIRCUIT. CIRCUIT HASH MARKS (WHEN INDICATED), LONG,
	SHORT, SINGLE DOT AND DOUBLE DOT REPRESENT PHASE, NEUTRAL, EQUIPMENT
	GROUND AND ISOLATED EQUIPMENT GROUND RESPECTIVELY. #12 IN 3/4" CONDUIT UNLESS
	OTHERWISE INDICATED
	CIRCUIT CONTINUATION
	CONDUIT STUBBED OUT AND CAPPED
(xxx)	UNDERGROUND DUCT BANK NUMBER — WIRE AND CONDUIT SIZE AS SPECIFIED IN UNDERGROUND DUCTBANK SCHEDULE
FAA	FIRE ALARM ANNUNCIATOR
FACP	FIRE ALARM CONTROL PANEL
F	FIRE ALARM MANUAL PULL STATION
(CR)	FIRE ALARM CONTROL RELAY
Ě	FIRE ALARM CONTACT, FLOW SWITCH
(E)	FIRE ALARM CONTACT, TAMPER SWITCH
Š	
9	FIRE ALARM CONTACT, PRESSURE SWITCH

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ORGINAL SIGNED AND SEALED BY
JOSEPH F. PUZIO
N.J.P.E. # GE33922

ORIGINAL

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Checked by: Plot sode:

Submitted by: CAD File Name:

U.S. ARMY ENGINEER DISTRICORPS OF ENGINEERS
KANSAS CITY, MISSOURI

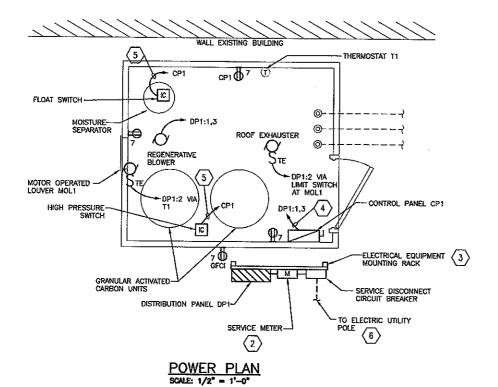
NIT 4 ROCKAWAY, NEW JEF CTRICAL SYMBOL

GENERAL NOTES:

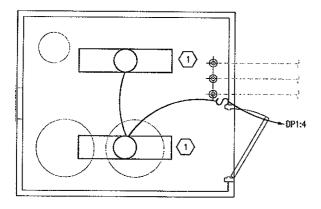
- THIS IS A STANDARD ELECTRICAL SYMBOLS SHEET. ALL SYMBOLS MAY NOT BE USED ON THIS PROJECT.
- SCREENING OR SHADING OF WORK IS USED TO INDICATE EXISTING COMPONENTS OR TO DE-EMPHASIZE PROPOSED IMPROVEMENTS TO HIGHLIGHT SELECTED TRADE WORK. REFER TO CONTEXT OF EACH SHEET FOR USAGE.
- SEE INSTRUMENTATION SYMBOLS SHEET FOR PROJECT SPECIFIC EQUIPMENT SYMBOLS, EQUIPMENT ABBREVIATIONS AND PIPING SYSTEM ABBREVIATIONS.

Sheet Reference Number:

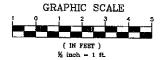
E-100



WALL EXISTING BUILDING



LIGHTING PLAN SCALE: 1/2" = 1'-0"



KEY NOTES:

- 2 PROVIDE SERVICE METER ENCLOSURE PER ELECTRIC UTILITY'S REQUIRMENTS.
- 3 SEE DETAIL FOR ELECTRICAL EQUIPMENT MOUNTING RACK ON SHEET 01E-D3.
- 4 3 #10, 1 #10G, 3/4°C.
- 5 3 #14, 3/4°C.
- $\overbrace{5}$ see drawing e-102 for site plan showing continuation of underground conduit to electric utility pole.

	PANELSOARD NO:	DP1														
VOLTAGE:		240/120	0	BUS RA	US RATING (A):				100			ENCLOSURE:		NEWS 20		
	PHASE:	1		MAIN O	ECE:						MOUNTING:		NEMA 3R MOUNTING RACK			
	WIRE:	3+GND		INTER	RUPTING	F RAT	IN	3 ((KA):	22			LOCAT	ION:	EXTERIOR	
	200% NEUTRAL:	NO		SERVI	CE ENTS	RANCE	L	4BE	EL:	Y						
CKT	t .	CONE	ECTED	LOAD	(VA)	OÇP			0CP		CONN	ECTED	LOAD	(AV)	I	СК
	DESCRIPTION	LTS	REC	MECH	MISC	AMPS	Ρ		AMPS	P	LTS	REC	MECH	MISC	DESCRIPTION	NO
	CONTROL PANEL	\vdash			1,560	25	2	A	15	1			345		ROOF EXHAUSTER	2
	CP1				1,560	Į.		В	20	1	176				LIGHTS	4
	SPARE					20	1	A	20	1				T	SPARE	6
_	RECEPTACLES		720			20	1	В	20	1					SPARE	8
9	SPACE	لــــــــــــــــــــــــــــــــــــــ						A		П			Ī	<u> </u>	SPACE	10
11	SPACE .							В		╗					SPACE	1
13	SPACE							A		7			1	1	SPACE	124
15	SPACE							В	Į	7					SPACE	120
	SPACE							A		╗					SPACE	1.0
19	SPACE	1						В		٦				1	SPACE	20
						LOA	D	SU	MMARY	-					-	
		LTS	REC	MECH	MISC	SPAR	Εļ	T	JATO						PHASE BALANC	E
	NECTED LOAD (KVA)	0.2	0.7	0.3	3.1				4.4	П	240	LINE-TO	D-LINE	VOLTS	PHASE A (KVA)	<u>-</u>
DEM	AND FACTOR	1.25	NEC	1.00	1.00	20%		-		ı			TED AMP		PHASE B (KVA)	1
DES:	IGN LOAD (KVA)	0.2	0.7	0.3	3.1	0.9	╛		5.3	ı		DESIGN				

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J.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS KANSAS CITY, MISSOURI

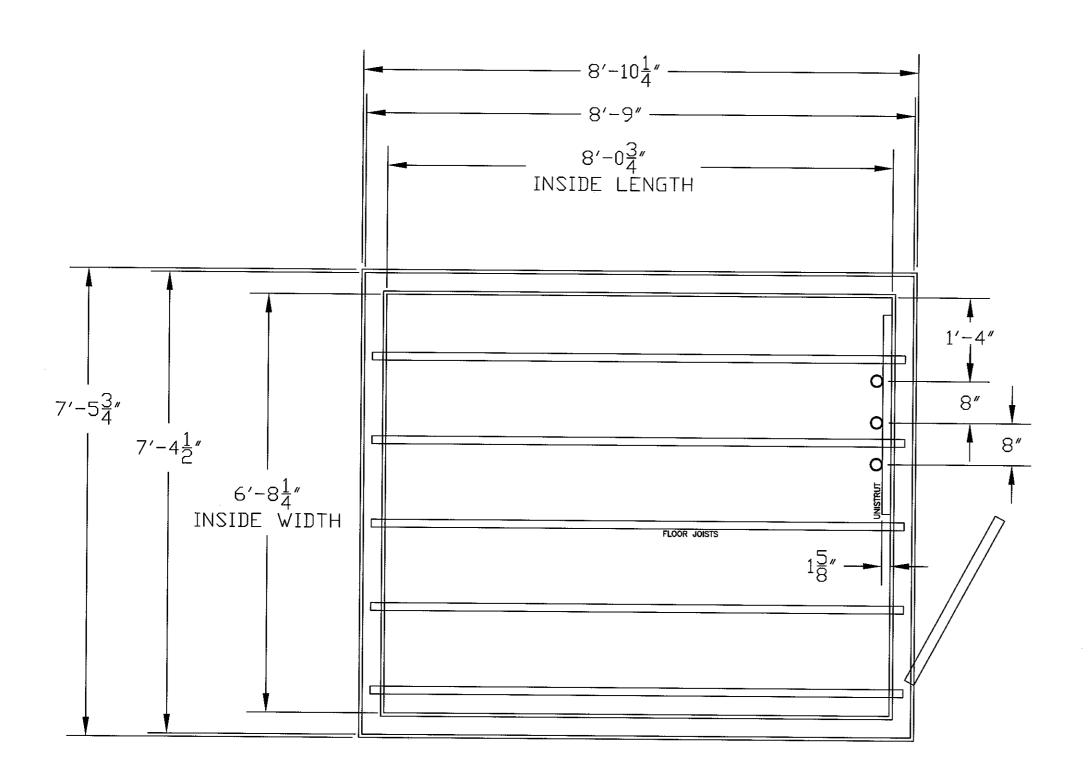
OVERABLE UNIT 4 ROCKAWAY, NEW JERSEY

LIGHTING AND POWER PLANS

Sheet Reference Number:

E-101

PIPE FLOOR PENETRATION LOCATIONS

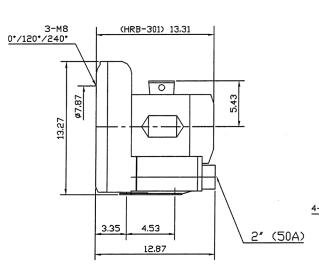


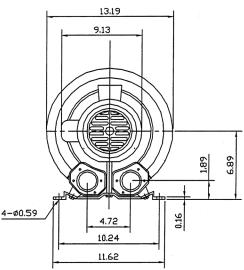


Republic Regenerative Blower HRB 301

Republic offers a complete line of regenerative blowers for high vacuum or compressed air applications in both horizontal and vertical mounted postions. TEFC motors are UL, cUL and CE certified. The impeller is directly connected to the motor shaft, providing powerful air force without undue friction. The bearings are outside the compression chamber, ensuring maximum operational reliability under high differential pressure. This low-maintenance, oil-free design provides continuous, dependable service to our customers.







Advantages

- ▲ Low noise 75dB
- ▲ Continuous, low-maintenance operation
- Saves space and electricity
- ▲ Trouble-free installation
- ▲ Easy replacement of parts
- Outboard bearings yielding longer life
- ▲ Dual voltage 110/220

Product Options

- ▲ 2" Relief Valve (recommended)
- Inlet Filter (recommended)
- Liquid filled gauge
- ▲ Check Valve
- Belt-driven bare shaft blowers are available
- ▲ Explosion proof motors available (Class 2/GroupB/Division 1 Certified)

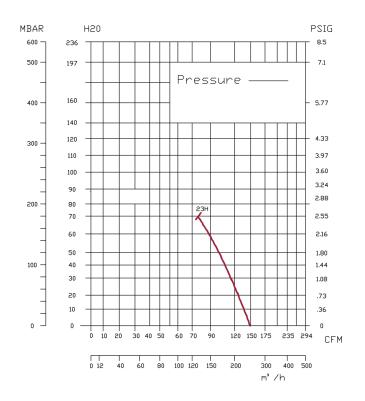
Model	Phase	Motor (HP)	Current @110 V		Sound Level (dB)	Rated Pressure (in. H ₂ O)	Rated Vacuum (in. H ₂ O)	Air flow (cfm)	Weight (lbs)
HRB301	1	2	23	11.5	75	71	63	141	73



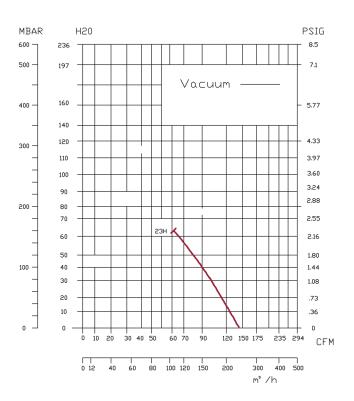
Republic Regenerative Blower HRB 301

Blower Systems®

Pressure vs. CFM



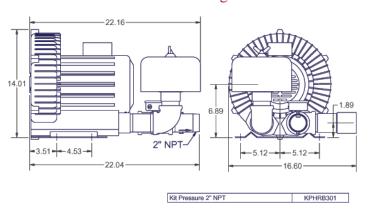
Vacuum vs. CFM



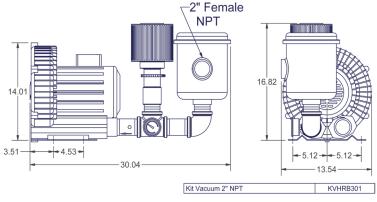
Performance for all blowers is 60 Hz. Ask for information on 50 Hz.

All Republic Regenerative Blowers are available in preassembled kits for either pressure or vacuum applications. These kits include an inlet filter and relief valve, and have been tested prior to shipment. Optional items for these kits include check valve and gauge.

KPHRB301 - Pressure Kit Drawing



KVHRB301 - Vacuum Kit Drawing



Rockaway OU-4 (26812)Date: 12/22/2010

New Jersey Department of Environmental Protection Control Device Inventory

CD NJID	Facility's Designation	Description	СD Туре	Install Date	Grand- Fathered	Last Mod. (Since 1968)	CD Set ID
CD1	Carbon 1		Adsorber	12/10/2010	No	12/10/2010	
CD2	Carbon 2		Adsorber	12/10/2010	No	12/10/2010	

000000 CD1 (Adsorber) Print Date: 12/22/2010

Make:	
Manufacturer:	TetraSolve
Model:	VFD-85
Adsorber Type:	Fixed (Non-Regenerative)
Description:	
Maximum Gas Flow Rate to Adsorber (acfm):	100.0
Maximum Temperature of Vapor Stream to Adsorber (°F):	120.00
Minimum Temperature of Vapor Stream to Adsorber (°F):	50.00
Minimum Moisture Content of Vapor Stream to Adsorber (%):	0.1
Type of Adsorbant:	Activated Carbon
Bed Height:	
Bed Length:	
Bed Width:	
Units:	
Other Bed Dimension:	
Value:	
Units:	
Minimum Pressure Drop Across Adsorbant (in. H20):	
Maximum Pressure Drop Across Adsorber (in. H20):	2.000
Total Weight of Adsorbant (lbs):	250.0
Total Weight of Adsorbant When Saturated (lbs):	375.0
Maximum Adsorbant Capacity (lbs Adsorbate/lbs Adsorbant):	
Minimum Adsorbant Capacity (lbs Adsorbate/lbs Adsorbant):	,
Set-up Type:	Series 🔻
, ,,	
Method of Determining Breaktinous	th (check all that apply):
Continuous Emissions Monitor (CEM):	gh (check all that apply):
Continuous Emissions Monitor (CEM):	gh (check all that apply):
Continuous Emissions	gh (check all that apply):
Continuous Emissions Monitor (CEM): Replacement By Weight: Periodic Testing:	
Continuous Emissions Monitor (CEM): Replacement By Weight:	sh (check all that apply): See attached scope See attached scope
Continuous Emissions Monitor (CEM): Replacement By Weight: Periodic Testing: Sampling Frequency:	See attached scope
Continuous Emissions Monitor (CEM): Replacement By Weight: Periodic Testing: Sampling Frequency: Sampling Device:	See attached scope
Continuous Emissions Monitor (CEM): Replacement By Weight: Periodic Testing: Sampling Frequency: Sampling Device: Other:	See attached scope
Continuous Emissions Monitor (CEM): Replacement By Weight: Periodic Testing: Sampling Frequency: Sampling Device: Other: Description: Minimum Concentration at	See attached scope

000000 CD1 (Adsorber) Print Date: 12/22/2010

	1 mit Bate: 12/22/2010
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-Permitted Sources):	1
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	
Have you attached data from recent performance testing?	○ Yes ● No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	Yes No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	■ Vae No

Comments:

000000 CD2 (Adsorber) Print Date: 12/22/2010

Make:	
Manufacturer:	TetraSolve
Model:	VFD-85
Adsorber Type:	Fixed (Non-Regenerative)
Description:	
Maximum Gas Flow Rate to Adsorber (acfm):	100.0
Maximum Temperature of Vapor Stream to Adsorber (°F):	120.00
Minimum Temperature of Vapor Stream to Adsorber (°F):	50.00
Minimum Moisture Content of Vapor Stream to Adsorber (%):	0.1
Type of Adsorbant:	Activated Carbon
Bed Height:	
Bed Length:	
Bed Width:	
Units:	
Other Bed Dimension:	
Value:	
Units:	
Minimum Pressure Drop Across Adsorbant (in. H20):	
Maximum Pressure Drop Across Adsorber (in. H20):	2.000
Total Weight of Adsorbant (lbs):	250.0
Total Weight of Adsorbant When Saturated (lbs):	375.0
Maximum Adsorbant Capacity (lbs Adsorbate/lbs Adsorbant):	
Minimum Adsorbant Capacity (lbs Adsorbate/lbs Adsorbant):	,
Set-up Type:	Series 🔻
, ,,	
Method of Determining Breaktinous	th (check all that apply):
Continuous Emissions Monitor (CEM):	gh (check all that apply):
Continuous Emissions Monitor (CEM):	gh (check all that apply):
Continuous Emissions	gh (check all that apply):
Continuous Emissions Monitor (CEM): Replacement By Weight: Periodic Testing:	
Continuous Emissions Monitor (CEM): Replacement By Weight:	sh (check all that apply): See attached scope See attached scope
Continuous Emissions Monitor (CEM): Replacement By Weight: Periodic Testing: Sampling Frequency:	See attached scope
Continuous Emissions Monitor (CEM): Replacement By Weight: Periodic Testing: Sampling Frequency: Sampling Device:	See attached scope
Continuous Emissions Monitor (CEM): Replacement By Weight: Periodic Testing: Sampling Frequency: Sampling Device: Other:	See attached scope
Continuous Emissions Monitor (CEM): Replacement By Weight: Periodic Testing: Sampling Frequency: Sampling Device: Other: Description: Minimum Concentration at	See attached scope

000000 CD2 (Adsorber) Print Date: 12/22/2010

Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-Permitted Sources):	1
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	
Have you attached data from recent performance testing?	○ Yes ● No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	Yes () No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	Yes () No

Comments:

VOC and HAP monitoring Rockaway OU-4 Soil Vapor Extraction System

Emissions from the Rockaway OU-4 vapor extraction system will be periodically monitored and sampled in accordance with this sampling plan to ensure that that volatile organic compound (VOC) and hazardous air pollutant (HAP) break-through does not occur. Sampling activities will be performed weekly for the initial four weeks after system start-up then monthly thereafter.

VOC monitoring activities will occur prior to sample collection and consist of the collection of Photoionization detector (PID) readings from the monitoring wells and multiple sample ports located at different stages of the treatment process and recorded in a log. The PID monitoring locations are:

- 1. Soil Vapor Extraction wells #1 and 2 and the lateral collection sample ports located inside the shed prior to the mixing manifold. Data collected from these monitoring locations will be used to determine how effective the system is in removing total VOCs from the vadose zone.
- The sample port located between the blower and the initial Carbon adsorber unit. Data collected from this location will be used to determine total VOC load on the Activated Carbon adsorber units, allowing LATA to adjust flows and dilution appropriately, ensuring that the Carbon adsorber units are not overloaded.
- 3. The sample port located between the initial and secondary Carbon adsorber. Data collected from this sample location will be used to ensure that break-through of VOCs and HAPs does not occur. If VOCs are detected at this sample location, then breakthrough of the primary Carbon adsorber has occurred, and the secondary unit is now adsorbing VOCs. Once a breakthrough has been detected, LATA will temporarily turn off the system, rotate the secondary adsorber unit into the primary position, and attach a virgin adsorber unit into the secondary position. The system will be re-activated once this process has been completed and the VOC-loaded adsorber will be disposed of off-site in accordance with local, state, and federal regulations.
- 4. The sample port located between the secondary carbon filtration unit and the exhaust. Data collected from this sample port will be used to verify that VOC breakthrough of the secondary Carbon adsorber unit has not occurred.

Sampling activities will be undertaken after the VOC monitoring activities are completed. Samples will be collected from the sample port located between the blower and the primary Carbon adsorber unit and the secondary Carbon adsorber unit and the system exhaust. A laboratory-certified clean 6-liter Summa canister with a regulator will be collected to each sampling location. Once the canister has been properly connected to the sampling locations, and a vacuum on the canister has been verified, the summa canisters and sampling ports will be opened and the initial pressures will be recorded. The summa canisters will be closed once the interior pressure of the canister is below -5 in/Hg and 0 in/Hg

and final pressure will be recorded. The samples will then be forwarded under chain of custody to a NJDEP-certified laboratory for TO-15 analysis.

VOC monitoring and TO-15 analytical results will be used to calculate approximate weight of contaminants removed from the vadose zone, to verify that the Carbon adsorber units have removed VOCs and HAPs from the soil vapor stream, and to verify that system exhaust is not exceeding permitted emissions.



Liquid & Vapor Filtration Remedial • Industrial • Municipal

Operation & Maintenance Manual

VFD • VFV • VF • VR SERIES

Tetrasolv Filtration Vapor Filters

CONTENTS

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1.0 GENERAL DESCRIPTION

The liquid series filters utilize fixed bed filtration to treat vapor. The filters employ a variety of medias to remove or catalyze contaminants. Flow through the filter may be either up flow or down flow depending upon the media supplied and the operation parameters. Generally inlet and outlet locations are indicated on the filter and or the filter drawings.

The most common application utilizes activated carbon as the adsorption media. Typically vapor which contains low levels of organic contaminants flows upward through the column of activated carbon where the larger organic molecules adhere to the porous structure of the activated carbon granules. This adsorption begins at the bottom of the "bed" and continues upward as the original adsorptive area becomes saturated.

Complete saturation of the carbon is dependent upon many factors such as contaminant levels, temperature, compounds being adsorbed, humidity, etc. Typically a carbon isotherm has been run on the influent stream to determine the expected rate of consumption of the activated carbon media. When monitoring has determined discharge air no longer meets discharge requirements the carbon will have to be removed and replaced (refer to section 5.0).

2.0 SAFETY CONSIDERATIONS

It is important that the entire O&M manual be read prior to set up and operation of the carbon system. If you have any questions please contact Tetrasolv Filtration at the number listed below or support@tetrasolv.com.

 WARNING: Where system pressure may exceed design pressure we strongly recommend the use of a relief device. Exceeding the maximum pressure of the filter could result in catastrophic failure of the vessel.

- Always adhere to "lockout/tagout" procedures when servicing the system.
- Wear appropriate safety equipment when operating system.
- ♦ WARNING: Wet or dry activated carbon preferentially removes oxygen from air. In closed or partially closed containers, oxygen depletion may reach hazardous levels. If workers must enter a container containing carbon, appropriate sampling and work procedures should be followed for potentially low-oxygen spaces - including all applicable federal and state requirements.
- WARNING: High concentrations of certain compounds such as BETX and low concentrations such as ketones, aldehydes, organic acids and sulphur may cause severe temperature rises.
- Understand the potential hazards of the stream being treated by the system. The activated carbon may contain higher concentrations of the contaminants being adsorbed than is in the influent stream. In addition the carbon may be considered hazardous material and therefore may require specific handling precautions unknown to Tetrasolv Filtration.

3.0 INSTALLATION

3.1 Shipment

Typically filters are shipped with media installed. However, in certain instances media is shipped to the site to be installed after installation. In very large systems it may be advisable to not install the media until adsorbers have been placed into final position and secured.

3.2 Unloading

Refer to the product data sheet for weight information for appropriate sizing information for the equipment to be used.

All components should be lifted either by crane or forklift as designated by the model.

 WARNING: Failure to follow the procedures outlined below can result in catastrophic damage to the system. Crane Lift - If a crane lift is to be used we recommend the following method. A "spreader" equaling 75% of the distance between the opposing lifting eyes on each adsorber should be used to insure proper lifting force direction. Attach an appropriately sized spreader beam and lifting cables to each lift eye of the component. The use of an experienced crane operator and quality equipment is highly recommended.

Fork-Lift - When using a forklift we recommend that the fork tubes on the filter be used or a pallet if the unit was shipped on a pallet.

3.3 Inspection

Perform the following inspections after un-loading the system. Note any discrepancies and contact TetraSolv immediately.

- Check the vessel exterior for damage which may have occurred during shipment. Inspect the support structures and piping support for damage.
- Inspect the piping system for damage. Insure the valves operate properly. Check installed instruments and instrument installation points for damage.
- If the filters are shipped without carbon visually inspect the interior of the vessel for damaged internals.
- Inspect the carbon discharge, drain and vent valves for damage

3.4 Set Up

The filter should be placed on a level concrete pad of appropriate thickness to support the system at it's maximum operational weight. The filter should be secured to the pad using appropriately sized anchor bolts.

Connect the site piping to the filter inlet and outlet connection points. It is important that all piping connected to the filter should be self supported. We also recommend in hard pipe installation that a flexible joint be used to further insulate the filter from vibration and stress.

Connect any gauges and instrumentation shipped

loose with the system.

The outlet piping if connected to a stack or vent should be designed to prevent the introduction of water or debris into the adsorber piping. Discharge piping should be sized equal to or greater than the diameter of the system piping or back pressure could occur creating excess pressure drop on the system.

Flowrates greater than 60 cfm / sq ft can produce bed fluidization in vapor phase filters. When this occurs carbon granules can be lifted and propelled out of the carbon bed in up-flow applications. In extreme cases large amounts of carbon can be expelled. If the system will be operating near or greater than the amount stated above please contact Tetrasoly for recommendations.

Carbon filters can be manifold in parallel operation for higher flowrates. Series operation is the preferred method of operation as it provides for the greatest degree of bed utilization.

Vapor conditions such as high humidity and high temperature (> 125° F) can cause inefficient adsorbtion to occur. If these conditions exist contact Tetrasolv for support. Also, any free water or product and debris should be eliminated with a knockout filter prior to the vapor stream entering the system. Many other vapor issues may effect Adsorber operation and we therefore recommend you discuss your specific installation with a representative.

4.0 OPERATION

4.1 Modes of Operation

With certain applications (2) filters in series flow are utilized. Listed below are typical operational modes.

- Shutdown Both filters completely off-line and isolated.
- Series Flow Influent enters primary filter and exits through secondary adsorber (this is the preferred method of operation)
- Isolation Flow Only one filter is receiving influent. This mode is typically used when the operator is maintaining the off-line filter.
- Parallel Flow Both filters are receiving the influent as the primary. Flow is split equally

between the filters. This mode is used when higher flow rates need to be achieved and contact times are not critical.

4.3 Monitoring

Adsorber units only require periodic monitoring if properly installed. The following items may be monitored:

Pressure: Check inlet and outlet pressure. Increase in pressure differential may indicate media breakdown or presence of high moisture. Rapid increase in pressure drop could indicate adsorber failure.

Samples: Inlet and outlet sample points if provided for vapor analysis to determine system performance.

5.0 ADSORBER SERVICING

The Adsorber may be serviced on-site using a vacuum removal method. Prior to servicing the unit should be closed off from influent and effluent lines and any electrical devices or connections should be tagged off.

After removal of the spent carbon is complete, it is recommended that the inside of the Adsorber be checked thoroughly and any minor maintenance conducted.

5.1 Carbon Loading - Bulk Bag

 WARNING - Dry activated carbon generates considerable dust. While activated carbon poses no health risk the dust can cause respiratory irritation and occasional skin rash. Therefore we recommended the use of proper clothing and dust mask during filling operation.

Hoist the bag over the manway and untie the outer bag exposing the inner chute. Untie the inner chute while clasping it shut. Remain holding the chute and carefully lower the chute into the manway. Un-clasp the chute and allow the carbon to discharge from the sack. The carbon should flow out very quickly and completely. When finished shake the bag and invert the chute into the bag.

If at any time you wish to stop the flow of carbon simply re-grasp the chute up high and cinch. Re-tie the bag.

5.2 Carbon Loading - Vacuum Method

manifold failure or leaking valves and gaskets.

In this method dry-activated carbon will be loaded into to the adsorbers using a vacuum rig. To add the carbon to the filters use the following method:

WARNING: Due to the low vacuum rating of the VF series adsorbers ($< 60" H_20$) only experienced change-out personnel should attempt this method of re-filling. Exceeding the recommend vacuum rating could lead to failure of the superstructure of the vessel.

- 1. Connect a 3" vacuum source to the auxiliary connection of the adsorber to be filled.
- 2. Install a 16" bolted transfer lid onto the manway opening of the adsorber to be filled.
- 3. Turn on the vacuum and check for good flow of air through the adsorber. Connect the fill line to the transfer lid and lead enough hose to reach the fresh carbon source (Note: This should be as short of a distance as possible).
- 4. Begin vacuuming carbon into the adsorber. It is important to note that the loading method is actually conveying and not true vacuum. The hose should contain 1/3 air with the carbon. Closely view the adsorber being filled. If the adsorber is collasping in excessively take less carbon and more air. This is something from experience and cannot be adequately explained here.
- 5. When transfer is complete the transfer lid should be removed and the carbon in the adsorber should be leveled out to insure even pressure drop across the bed.
- 6. Close the manway and turn the adsorber back on.

Note: When the system if first started up small amounts of fines may be present in the discharge stream. This is normal and should discontinue within a short period of time.

6.0 MAINTENANCE

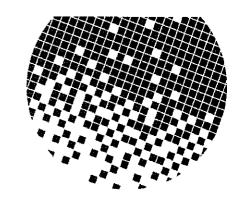
6.1 Extended Shutdown

If the system is to be shutdown for extended period of time it is recommended that the valve be placed in shutdown mode and the system water drain valve be left open.

Monitor the system closely after extended shutdown for signs of potential problems such as interior



HOME OFFICE 1424 Abraham Drive Anderson, IN 46013 765-643-3941 Phone www.tetrasolv.com



Warranty:

- All references to the Customer shall mean the Purchaser or the Lessee as applicable.
- (a) Tetrasolv warrants that any equipment which it manufactures will be free from substantial defects in material and workmanship for a period of six (18) Months from the date such goods are delivered to a carrier by Tetrasolv for shipment to the Purchaser.
- (b) The Purchaser agrees that the liability of Tetrasolv hereunder shall be limited to replacing, repairing or issuing credit for, at Tetrasolv's discretion, any equipment which is returned F.O.B. Tetrasolv's plant within the applicable term of the warranty, provided that (i) upon examination of the equipment Tetrasolv determines that the alleged defect constitutes a substantial defect, and (ii) the warranty made herein is not invalid pursuant to Section (d) hereof. The Purchaser agrees that such replacement, repair or credit shall be its sole and exclusive remedies hereunder. For purposes hereof, a substantial defect shall mean any defect which prevents the equipment from operating in accordance with Tetrasolv's published specifications. In the event that Tetrasolv determines that equipment which is no longer manufactured by it contains a substantial defect and the warranty covering the defective equipment is not invalid pursuant to Section (d) hereof, the purchaser's sole and exclusive remedy hereunder shall be the repair of such equipment or the replacement of such equipment with new equipment at Tetrasolv's discretion. In no case is equipment to be returned by the Purchaser without first submitting a warranty claim in writing to Tetrasolv and obtaining a return authorization number from Tetrasolv. Equipment which is repaired or replaced pursuant to this warranty shall continue to be warranted for the unexpired portion of the warranty term applicable to the equipment so repaired or replaced, Tetrasolv shall make the final determination as to the existence or cause of any alleged defect.
- (c) The foregoing warranty shall not be valid (i) if the alleged defect is the result of abuse, misuse, accident, alteration, neglect or unauthorized repair; (ii) the equipment is otherwise installed improperly; (iii) Any repair shall be deemed unauthorized unless it is made (i) by Tetrasolv or a duly authorized agent of Tetrasolv or (ii) with the written consent or Tetrasolv.

- (d) The operating efficiency of treatment, abatement, and recovery equipment and systems is affected by factors extrinsic to their manufacture, including operating environment and such conditions of use as contaminant and related substance build-up, the frequency and type of operator maintenance and other external variables. For these reasons, specific levels of performance cannot be guaranteed for such equipment and systems.
- (e) THIS WARRANTY IS THE SOLE WARRANTY MADE BY Tetrasolv TO THE Purchaser AND IS IN LIEU OF ALL OTHER WARRANTIES OR OBLIGATIONS, EXPRESS OR IMPLIED. Tetrasolv EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.
- (f) THE Purchaser AGREES THAT IN NO EVENT SHALL Tetrasolv BE LIABLE FOR SPECIAL, INCIDENTAL, INDIRECT, EXEMPLARY OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF PROFITS OF LOSS OF USE OR ANY OTHER ECONOMIC LOSS, WHETHER BASED ON CONTRACT, TORT OR ANY OTHER LEGAL THEORY.
- (g) THE REMEDIES PROVIDED HEREIN ARE Purchaser'S SOLE AND EXCLUSIVE REMEDIES.

Rockaway OU-4 (26812)

New Jersey Department of Environmental Protection Emission Points Inventory

PT NJID	Facility's Designation	Description	Config.	Equiv. Diam.	Height (ft.)	Dist. to Prop.	Exhaus	t Temp.	(deg. F)	Exha	aust Vol. (a	cfm)	Discharge Direction	PT Set ID
ИЗПО	Designation			(in.)	(11.)	Line (ft)	Avg.	Min.	Max.	Avg.	Min.	Max.	Direction	Set ID
PT1	Exhaust	Exhaust pipe exiting roof of shed	Round	2	11		77.0	50.0	120.0	50.0	25.0	100.0	Down	

Rockaway OU-4 (26812)

New Jersey Department of Environmental Protection Emission Unit/Batch Process Inventory

U 1 Vapor Wells Two vapor wells and one subslab vapor collection system connected to the mixing manifold present before the moisture separator.

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Ann Ope Min.	er.	VOC Range	Flow (acfi Min.			mp. g F) Max.
OS1	OS1	Normal operating scenario	Normal - Steady State	E1	CD1 (P) CD2 (S)	PT1		4,380.0	8,760.0	A	50.0	141.0	25.0	25.0

000000 U1 OS1 (Efficiency Table (CD1)) Print Date: 2/18/2011											
Pollutant Category		Capture Efficiency (%)	Removal Efficiency (%)	Overall Efficiency (%)							
CO											
HAP (Total)		98.00		98.00							
NOx											
Other (Total)											
Pb											
PM-10											
PM-2.5											
SO2											
TSP											
VOC (Total)		98.00		98.00							

000000 U1 OS1 (Efficiency Table (CD2)) Print Date: 2/18/2011											
Pollutant Category	Capture Efficiency (%)	Removal Efficiency (%)	Overall Efficiency (%)								
CO											
HAP (Total)	98.00		98.00								
NOx											
Other (Total)	1										
Pb	1										
PM-10											
PM-2.5											
SO2											
TSP											
VOC (Total)	98.00		98.00								

Rockaway OU-4 (26812) Date: 2/18/2011

New Jersey Department of Environmental Protection Potential to Emit

Subject Item: E1 Blower 1

Operating Scenario:

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
СО					lb/hr	No
HAPs (Total)	0.00000000	0.36000000	0.00700000	0.00700000	lb/hr	No
Tetrachloroethylene	0.00000000	0.36000000	0.00700000	0.00700000	lb/hr	No
VOC (Total)	0.00000000	0.36000000	0.00700000	0.00700000	lb/hr	No

U1 Vapor Wells Subject Item:

Operating Scenario: OS0 Summary

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
HAPs (Total)	0.00000000	1.57000000	0.03200000	0.03200000	tons/yr	No
Tetrachloroethylene	0.00000000	1.57000000	0.03200000	0.03200000	tons/yr	No
VOC (Total)	0.00000000	1.57000000	0.03200000	0.03200000	tons/yr	No

U1 Vapor Wells Subject Item:

Operating Scenario: OS1

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
HAPs (Total)	0.00000000	0.36000000	0.00700000	0.00700000	lb/hr	No
Tetrachloroethylene	0.00000000	0.36000000	0.00700000	0.00700000	lb/hr	No
VOC (Total)	0.00000000	0.36000000	0.00700000	0.00700000	lb/hr	No

Air emission calculations were completed based on the system start up report prepared by Groundwater Treatment & Technology (GWTT) Inc. According to the report GWTT operated the system for a short period of time on behalf of the USEPA and AECOM, to monitor system efficiency and operation. PID readings were obtained on the piping inside the shed for the SVE-1, the SVE-2 legs, as well as the SSDS leg. Additional PID readings were obtained on the blower effluent/lead adsorber influent, at the midpoint between the adsorbers, and on the discharge stack. The adsorbers consist of two 55 gallon granular activated carbon drums. The table below summarizes the detected range of PID readings for each location.

Location	PID Reading (ppm)
SVE-1	40 – 50
SVE-2	30 – 45
SSDS	10 – 20
Blower Discharge	18 – 25
Between Adsorbers	0
Stack	0

The flow ranges for the three legs are summarized below:

Location	Flow (scfm)		
SVE-1	10 – 30		
SVE-2	20 – 30		
SSDS	35 – 45		

The combined air flow for the system using the mid point for each range is 85 cfm at approximately 30 ppm.

To calculate the emissions the following conservative system parameters were assumed:

- Maximum system air flow rate = 141 cfm
- Total VOC vapor concentration = 100 ppm

To determine the emissions it was assumed that the total VOC vapor concentration was composed entirely of tetrachloroethylene (PCE). This assumption was used as a conservative approach to determine total volatile organic emissions since PCE has the greatest molecular weight compared to the other likely volatile organic contaminants present in the air stream.

Emissions were then calculated assuming a pressure at atmospheric and temperature of 25 degrees Celsius. Using the Ideal Gas Law, the molar volume for an ideal gas was calculated:

$$V_m = \frac{V}{n} = \frac{RT}{P}$$

- Pressure = 1 atm
- n = moles
- Temperature = 25° C + 273.15 K = 298.15 K
- R = Gas Law Constant = 0.082057 L atm/Kmol

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$$V_m = \frac{0.082057 \frac{L atm}{K mol} \times 298 K}{1 atm} = 24.46 \frac{L}{mol}$$

At these environmental conditions, using the ideal gas law one mole of any gas occupies a volume of 24.46 liters.

The concentration of 100 ppm, expressed as 100 μ L/L, total VOCs was then converted to g/m³ as follows using the molar mass of PCE:

$$\frac{100 \; \mu L}{L} \; x \; \frac{1 \; mol}{24.46 \; L} \; x \; \frac{1 \; L}{1000000 \; \mu L} \; x \; \frac{165.83 \; gram}{mol} \; \; x \; \frac{1 \; L}{0.001 \; m^3} = 0.678 \; \frac{g}{m^3}$$

• $165 \, {}^{g}/_{mol} = molar mass of PCE$

This was converted to lb/cf:

$$\frac{0.678 g}{m^3} x \frac{1 lb}{453.6 g} x \frac{1 m^3}{35.31 cf} = 0.00004 \frac{lb}{cf}$$

Using an air flow rate of 141 cfm the following emissions into the carbon units was calculated:

Total VOC emissions
$$\frac{lb}{min} = 4.23 \times 10^{-5} \frac{lb}{cf} \times 141 \frac{cf}{min} \times 60 \frac{min}{hr} = 0.36 \frac{lb}{hr}$$

Using an efficiency of 98% for the carbon units the total VOC emissions after treatment were calculated to be:

Total VOC emission
$$\frac{lb}{hr} = 0.36 \frac{lb}{hr} - (0.36 \frac{lb}{hr} \times 0.98 \text{ efficiency}) = 0.007 \frac{lb}{hr}$$

Total VOC emission
$$\frac{lb}{yr} = 0.007 \frac{lb}{hr} \times \frac{8760 \text{ hr}}{yr} = 63.07 \frac{lb}{yr}$$

Total VOC emission
$$\frac{ton}{yr} = 63.07 \frac{lb}{yr} \times \frac{1 ton}{2,000 lb} = 0.032 \frac{ton}{yr}$$

Appendix D

Air Permit (pending)

